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The Mayor of Brooklyn, N. Y., on Electric Lighting.

Mayor Chapin of Brooklyn sent a communication recently to the Board of Aldermen on the subject of street lighting by gas and electricity. The business, he says, is a lawful one, and it is not necessary to assume that the persons engaged in it are worse or better than other men. These are some of the other interesting and timely things the Mayor says:

"As invention follows invention the material burdens of life should be gradually alleviated. Especially is this true in any department of science whose results are of practical utility to large bodies of population. Public and private lighting in cities should improve in quality and decline in cost when comparisons are made extending over any long period of years. Such has been the history of the lighting of Brooklyn.

"For the year 1888 the total amount paid for lighting was $411,096.29, which was distributed as follows: For gas, $232,721.29, and for electricity, $188,375. The appropriation for 1888 for lighting was $460,000, and for new lights, $20,000. Thus a surplus is carried to 1889 of $58,627.48.

"The city is better lighted than ever before, and its superiority in this respect, over the past, has a moral as well as a material significance. Regions once prone to lawlessness have been redeemed because they are brilliantly lighted. Such results are beneficial to the public morals and to the public treasury as well. It is not possible to promote morality in any quarter without, at the same time, promoting economy of administration and an enhancement of values. A well-lighted city furnishes fewer places of refuge for the vicious, and calls for the services of fewer policemen."

The mayor then compares Brooklyn with other large cities in the matter of street lighting, and by studying the figures reaches this conclusion: "That our own city is wise in making its contracts for but one year; that under this annual method we may look for a decline in price as the business of electric lighting increases, and that the price now charged may be profitable to the companies, and doubtless is, but cannot be called unreasonable. It may be said that by comparison with the past Brooklyn is lighted better and more cheaply than heretofore, and, in comparison with other cities, Brooklyn is lighted well and at reasonable cost; and that our method of committing ourselves to contracts of but one year in duration makes it practicable to secure the benefits of competition.

"The attempt to place the wires of the telegraph, telephone and kindred companies underground is naturally brought to mind by the subject matter of this communication, although but a few of the wires which it is desired to bury belong to the electric light companies. The reports of the officials having the matter in charge show that upon January 1 the mileage of wire already placed underground in those cities which have made most progress was: In New York, 4,444 miles; in Philadelphia, 360; in Washington, 1,672; in Chicago, 5,300; in Brooklyn, 2,920. The proportion between the underground wires and those still remaining overhead in Brooklyn was quite as favorable as in any city.

"It is also reported that the problem of burying wires bearing currents of electricity of high tension (such as those of electric arc light companies) has not been satisfactorily solved in any city of the world. It has not yet been demonstrated that an underground cable used for this purpose will endure for more than two years, under ordinary or average conditions. During the year 1888 the total number of poles removed, as reported, was 317. An equal number is now reported as marked for removal. Department wires have been and now continue to be largely removed from the poles on a number of important streets."

A Snake Problem.

At the meeting of the American Association for the Advancement of Science, which continues for a week during the latter part of August in some leading city to which they have been invited, the members very naturally find entertainment amongst themselves, a circumstance which always results from the intercourse of persons of congenial tastes; and it is noticeable how on such occasions that wit and humor is everywhere present, and especially prominent outside of the stated sessions of the organization, where the time is entirely devoted to the consideration of scientific questions.

An astronomer from Harvard Observatory recently propounded this problem, on an excursion which was held during the meeting at Cleveland, in August.

Suppose that three snakes, each two feet in length, should catch each other by the tip of the tail, thus making a circle six feet in circumference. Suppose that each snake should begin to swallow the one in front of him. In what way would the resultant figure, after each snake had swallowed the one in front of him, differ from the original circle, which was six feet in circumference when the snakes started?

There were many diverse opinions upon the subject, some of them entering the consideration of the fourth dimension of space, because any one of the snakes would have swallowed the two in front of him, and yet have been swallowed by the two in back of him, and therefore would be both inside and outside of his two fellows.

There is one method of considering the problem much like that reply of Franklin to a question in the French Academy, when he was asked: "Why does the addition of a live fish to a vessel of water not increase the weight of what is contained in the jar?"

Franklin replied, "Before we attempt to settle such a deep question, it would be well to apply the test of direct experiment." Therefore a live fish of known weight was put into a weighed basin of water, the result being very naturally that there was an increase in the total weight due to the heaviness of the fish.

In a like manner, one very practical person, in considering the question, replied, "Bring on your snakes."

SEELEY'S STORAGE BATTERY CABINET.

Overhead Wire Evidence.

(From the Boston Traveller.)

The West End Company have published in pamphlet form the array of evidence given at the State House hearing before the Street Railway Committee on the matter of safety in the overhead wire. Any one having doubts on this subject should possess this document, which is to be widely distributed. Indeed, it would be well for our citizens generally to study this collection of information, not only interesting of itself, but most important to the public. It compiles in a compact form the results of extensive and the scientific ultimatum on the subject. The testimony of Prof. Thomson is the most valuable and covers every point yet raised in connection with the electrical overhead system. A careful perusal of his statement will convince every unprejudicial mind and strengthen the faith of those who are the friends of the system. The safety of the current, and of the pressure upon it, and the record of harmlessness from use of the wire by 50 companies, is established. The apprehension from broken wires, the liability of firemen to shocks by touching wires, and every detail which imagination or accident or experience has brought into the controversy, is fully and most satisfactorily met. At this time it is not proposed to give either a summary of this strong proof or even to point out its special information. The best way for the citizens of Boston to become posted, and accurately so, on this invention, is to read this evidence carefully and thoughtfully, and they will have positive knowledge about this discussion. The object of this article is to call attention to this well-timed pamphlet and to earnestly commend its conclusions.

Date of the Summer Meeting of the National Electric Light Association.

TO THE EDITOR OF ELECTRICAL REVIEW:

The Executive Committee of the National Electric Light Association have fixed Tuesday, Wednesday and Thursday, August 6, 7 and 8, for the date of the Convention at Niagara Falls.

BENJAMIN RHODES,
Chairman Executive Committee.

Niagara Falls, N. Y., April 6, 1889.

Storage Battery Cabinet for Physicians.

The illustration published herewith is of a new design of cabinet set, containing three cells of storage batteries, especially made for physician's use. The arrangement is most convenient, the cells being snugly placed in the bottom half of the box (which is deeper than the illustration indicates), and the handy little rheostat is located on top as shown. In the REVIEW of March 9th the rheostat was described in detail. The Complete Electric Construction Company, 18 Cortlandt street, is engaged in the manufacture of these cabinets, using the Electrical Accumulator Company's batteries.

The Electric Light in Baltimore.

The protracted deliberations on the Baltimore electric light question by the committee on police and jail have at last borne fruit. The committee held a long session last week and decided to report a substitute for the ordinance committed to them, which gave the Waterhouse Electric Light Company the contract to light the city for five years at 40 cents per light, which would have been a saving of 10 cents on the present price paid the Brush Company. The substitute which the committee will offer provides that bids shall be advertised for in three of the city daily papers for three weeks. Bidders must file a bond of $5,000 guaranteeing their ability to fill the contract, which bond is to be forfeited to the city should such ability not be shown. The contract is to be awarded for two years to the lowest bidder, whose bid shall be less than 40 cents. The company to whom the contract is awarded will be required to give $20,000 bond for the carrying out thereof.

The electric railway at Topeka, Kans., was successfully started last week. The Thomson-Houston system is used and the line is about 17 miles in length, making it the longest electric road in the country. The citizens of Topeka are to be congratulated on their enterprise in this direction, and have set an example that many of our Eastern cities of much greater pretensions would do well to follow.

Arc Lamps and Their Mechanism.

BY PROF. SILVANUS P. THOMPSON, D. SC., M.I.E.E.

An arc lamp being an apparatus for transforming the electric energy supplied to it through the conducting wires into heat and light, it obviously cannot be expected to give a steady illumination unless it can be so arranged and operated that, in the first place, the rate at which it appropriates and transforms the electric energy is constant; and that, in the second place, the circumstances attending this transformation (in respect of the triple relation between the quantity of heat evolved, the degree of temperature, and the emissivity of the incandescent surface) also remain constant. The first of these two provisos relates to the operation of the system of lamps and dynamos (or other means of electric supply) acting conjointly; the second of them relates solely to the quality of the carbon pencils used as electrodes.

As the latter is a simple matter, it may be disposed of first. Suppose the pencils to be composed of a homogeneous carbon, the physical properties of which, such as hardness, specific thermal capacity, conductivity for electricity, conductivity for heat, emissivity, &c., are constant; also that they are cylindrical and of given diameter. Then it follows that if energy is being expended at a uniform rate in heating the tips of a pencil it will be maintained at a uniform temperature, and the amount of light emitted per square millimeter of the surface will be constant, and, as the section is constant, the rate of consumption constant, and the pencil homogeneous, the form once acquired by the incandescent tip (whether positive crater or negative peak) will remain constant It may be remarked, in passing, that the researches of Capt. Abney have shown that the white light of the incandescent carbon surface of the crater at the positive pole of the arc is always of precisely the same composition in respect of the relative proportions of waves of different colors. This most important observation indicates beyond doubt that the temperature of the actual light-emitting surface is always the same. Indeed, this ought to be the case if the latent heat of vaporization of carbon be a positive quantity. When the surface attains this temperature volatilization begins; and when so begun the temperature cannot rise further, any more than ice can be raised above its temperature of fusion. The limiting temperature of the voltaic arc is the temperature of volatilization of the material of the electrodes. This is, in itself, a reason why the introduction of all known foreign substances whatsoever into the carbon pencils of the arc is found to lower its intrinsic brilliancy; for all known elements have a lower temperature of volatilization, and all compounds are dissociated at arc temperatures.

If, then, we may assume homogeneity of the carbons to be used the steadiness of the arc light will depend solely upon the maintenance of a steady rate of appropriating and transforming electric energy. How a want of homogeneity may be compensated for in the actual working of the lamp is a point reserved for consideration later.

The rate at which electric energy is appropriated from the wires, and transformed in the lamp into heat and light, always depends both upon the construction of the lamp and upon the conditions imposed upon the system of electric supply. This is a mere consequence of the fact, well known to every electric engineer, that the amount of electric energy per second appropriated by any electric device, motor or accumulator, is itself the product of two quantities—the current and the pressure (or potential) at which the current is supplied. To put the matter in electrician's language, the number of *watts* of electric energy per second appropriated by the lamp is equal to the number of *amperes* that flow through it multiplied by the number of *volts* that may be applied as a difference of potentials between its two terminals. To keep constant the *product* of the amperes and the volts is the practical problem which the mechanism of the arc lamp must be designed to solve.

A point of much theoretical interest, and in reality of great practical importance, is the fact, long disputed, now established beyond question, that the arc itself does not act simply as an added resistance in the path of the current, but exercises also a counter-electro-motive force, and tends to set up an opposing current. The apparent resistance of the arc resembles that of an electrolytic cell, or that of an electric motor when running, or, that of a thermopile when a current from an external source is passed through it. The current which flows through the arc arouses, by a species of polarization, an opposing electro-motive force. The simplest fact in proof of this is that, unlike any ordinary conductor, the apparent resistance of the arc is not proportional to its length. The apparent resistance of an arc two millimeters in length between the carbon tips is not double that of an arc one millimeter in length, nor anything near double. The fairest way to investigate the matter is to make a series of experiments with arcs of different lengths, the current being independently so regulated as to be maintained of the same strength in each case. There appears to be a true resistance proportional to the length, and a back-electro-motive force which in steady arcs, and with currents of from 7 to 15 amperes, appears to be about 38 to 39 volts. When the arc hisses, as often happens if the length of it be very short, the back-electro-motive force fluctuates very much, but always drops to something under 20 volts. Except in the case of constant-current circuits, this causes a sudden increase of current when the lamp begins to hiss, and it may be noticed that the light, though unsteady during hissing, is brighter at the negative pole of the arc.

Hitherto, all guesses as to the cause of this counter-electro-motive force have been very vague, not to say wild. To account for 39 volts of polarization on any hypothesis that it is due to electrolytic or thermo-electric action, is to suggest causes which are, to say the least, wholly inadequate. The explanation which for the past two years I have been in the habit of suggesting to my students, and which has not been otherwise published hitherto, is as follows: Every reversible phenomenon which the current can itself produce, and which requires an expenditure of energy for its production, necessarily implies the exhibition of a counter-electro-motive force. One has only to look at the cases of the reversible chemical action in a cell, of the reversible magneto-mechanical action of a motor, the reversible heating effects of a thermo-electric junction, to comprehend this. Now, the phenomenon of volatilization is a reversible one; give to the solid carbon at its volatilization temperature the necessary latent heat, it is changed to vapor; take from the vapor its latent heat, it condenses back to solid carbon. The arc under normal circumstances is the seat of an actual evaporation of carbon at the positive pole, as well as of a combustion at both poles. So far as any data exist, it appears that the excess of carbon consumed at the positive pole by an ordinary continuous current is about 0.5 grammes per ampere hour. If we knew the latent heat of volatilization of carbon per gramme, we could calculate *à priori* the necessary minimum electro-motive force at the positive pole, which would obviously represent the counter-electro-motive force so far as it is situated at that point. With long arcs the excess of consumption of the positive pencil over that of the negative is both less and more regular than that which occurs with short arcs. With short arcs three other phenomena occur which are important in this connection. Firstly, the short arc is liable to whistle or hiss, giving evidence of instability; secondly, it frequently gives rise to "mushrooms," or irregular growths of carbon upon the apex of the negative pencil; thirdly, when it hisses the counter-electro-motive force becomes very unsteady, but appears to have an average value about half that of the steady long arc. It is worth while to throw out the suggestion that the condensation of carbon at the negative pole in the short arc is accountable for the change in electro-motive force, and for the instability which manifests itself by the hissing sound.

Passing from these conjectures to the construction of lamps for the production of light by the arc, we are now prepared to lay down the points which must be provided for in every arc lamp. It must be emphatically pointed out at the outset, that as the preformance of a lamp depends upon the condition under which it is supplied with electric energy by the circuit, the design of the lamp necessarily also depends on those conditions. In the present state of the art of electric distribution we may classify the conditions of electric supply under the following heads:—

I.—CONTINUOUS SUPPLY AT CONSTANT POTENTIAL.

In this case the arc lamps are arranged either simply all in parallel or in parallels containing two in series, the currents being divided by mains and branches to the lamps. At least 55 volts should be allowed between the mains for single arcs. Practice shows that arc lamps in parallel burn more steadily if a resistance wire of .25 to 1.0 ohm be included in the lamp circuit. Taking the back electro-motive force of a steady arc at 30 volts, it is obvious that the excess of the volts at the mains over this represents the volts used in driving the current through the actual resistance in the main circuit of the lamp. This resistance consists of four parts—the true resistance of the arc itself, which may vary from $\frac{1}{10}$ to $\frac{1}{2}$ ohm; the resistance of the carbon pencils, which averages about 0.15 ohm per foot per plain carbons; the resistance of the main-circuit coils, which varies in different lamps from 0.05 to 0.2 ohm; and the resistance of the wire introduced for steadying the lamp. In a 10-ampere lamp, working at 55 volts at the mains, 16 volts remain, after deducting 39 for the back electro-motive force, and these 16 are approximately distributed as follows:—2 volts in the arc itself, 3 volts in the carbons (say 2 feet long in the total), 1 volt in the main coil, and 10 volts in the steadying resistance.

SEE PAGE 3 FOR DESCRIPTION.

II.—CONTINUOUS SUPPLY WITH CONSTANT CURRENT.

In this case the arc lamps arranged in series, the whole of the current going from one lamp to the next, and returning to the dynamo after having traversed successively all the lamps. This is, *par excellence*, the arc light system of distri ution, the parallel system at constant potential requiring heavier mains. As the lamps arranged in series tend to steady one another, it is not necessary to allow more than 45 to 50 volts per lamp, including the ordinary lengths of cable from lamp to lamp. From 5 to 10 amperes is the usual current for arc lamps in series.

III.—ALTERNATING SUPPLY AT CONSTANT POTENTIAL.

In this case also the lamps are usually arranged as in the first case, the only difference being in certain structural details, such as lamination of iron cores.

IV.—ALTERNATING SUPPLY WITH CONSTANT CURRENT.

This case can hardly be said to be practical, though alternate-current dynamos, capable of supplying six or eight lamps in series, have been constructed in past years.

The supply systems, whether continuous or alternating, must be assumed, for the purpose of this paper, to perform efficiently what they possess, namely, to maintain constant one of the two factors of the electric power which they supply to the distributing system. In each case it remains for the mechanism of the lamp to effect such adjustment as will maintain constant the other factor of the product. If the condition of supply is at constant potential, then it is for the lamp itself so to adjust its carbons as to keep the current through the arc constant. If the condition of supply is with constant current, then the lamp must adjust its carbons to maintain between them the requisite potential. Hence the differences which are necessary in construction between those lamps which are to work at constant potential and those which are to work with constant current. These differences, as will now be shown, chiefly affect the feeding mechanisms of the lamp.

In discussing the necessary mechanisms af arc lamps, no further reference will be made to lamps of the Jablochkoff candle type, nor to those with abutment blocks of marble ("Sun" lamp, etc.), nor to the so-called incandescence arc ("Semi incandescent") lamps, nor to those with curved carbons (Heinrichs's type), nor yet to those with horizontal carbons (De Mersenne's, Solignac's, etc.)

NECESSARY MECHANISM OF ARC LAMPS.

Driving Power.—In every lamp some means of mechanism is required to propel the carbons toward one another as they burn away, gravity being by far the most common agency for doing this.

Feeding Mechanism.—As the carbons burn away, one or both of them must be propelled forward to maintain the arc at its proper size. This action is called "feeding" the arc. This action ought to take place by small and imperceptible amounts, and as the rate of consumption of the carbons is continually varying, even with carbons of the best modern manufacture, the lamp must itself regulate the rate at which the pencils are propelled forward in automatic correspondence with the consumption for the time being. Further, since the presence of soft and more readily volatilized portions in the pencils seems to be unavoidable, provision ought to be made, so that whenever the pencil burns down to such a portion, causing a sudden increase in the volume of the flame or arc—technically called a "blower"—the mechanism of the lamp ought at once automatically to draw apart the pencils to a slightly greater distance. A lamp which has a *retractile* motion in either its feeding or its striking mechanism is superior to one that has not, as it can be used with cheaper and less pure brands of carbons. An adjustment, *c*, for regulating the frequency or range or the feeding movement is usual.

Replacement Mechanism.—When the pair of carbon pencils has burned away, the lamp trimmer has to replace the stumps by a new pair of long carbons. In order to admit these, the carbon holders must be pushed apart to their widest extent. Special mechanical devices for allowing this motion to occur have to be provided in some forms of lamp, whilst other forms need no special device.

Moderating Mechanism.—To prevent the carbon from making too sudden motions, it is usual to add a moderating device, such as a dash-pot, or, in the case of those lamps in which there is a train of wheels, a fan, or a governor.

So far, the devices enumerated have been such as are common to all classes of lamps. Those which follow are only required in particular types of lamp.

Focussing Mechanism.—In all those cases where it is desired that the luminous points should occupy a fixed position in space, some additional mechanism is necessary to make the arc lamp keep its focus. In lamps designed for the mere lighting of area, this is not important, and in the vast majority of these the upper carbon descends whilst the lower carbon (the negative) is fixed, the luminous point slowly shifting downwards as the carbons consume. All devices for causing the carbons to move forward at such relative rates as to keep an approximately fixed position for the arc will be discussed, together with their methods of adjustment, *f*, under the heading of focussing mechanism.

Snow Broom for Use on Electric Railways.

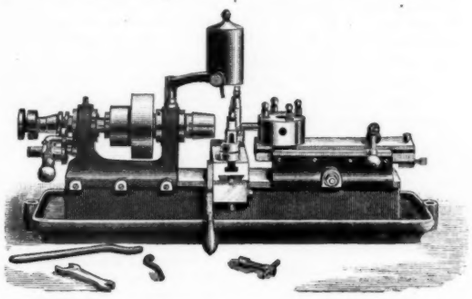
Anticipating the usual New England winter, the Thomson-Houston Company designed a snow broom (shown in the accompanying cut) for use on the Cambridge Division of the West End Street Railway. The truck which is of the Brill type, and has a five foot wheel base, is equipped with a 30 h. p. motor geared to drive the truck at a speed of 12 miles per hour. The snow broom is 30 inches in diameter and set at an angle of 45 degrees. It is driven by a stationary motor of 20 h. p. at a speed of 100 revolutions per minute. But two men are required to operate the broom, the brake and controlling mechanism being placed in such a position as to render it an easy matter. The broom was used for the first time Sunday, March 31, during the snow storm and gave perfect satisfaction, and it was also tested by placing bricks and boards in front of it, and the way these were brushed aside to a distance of four or five feet from the track, leaves no doubt of the ability of this appliance to cope successfully with heavy storms. The company has also built a much larger machine, with 36 inch wheels and fitted with two brooms and a scraper, which will be able to deal with the severest storms.

Machinery Manufacturers.

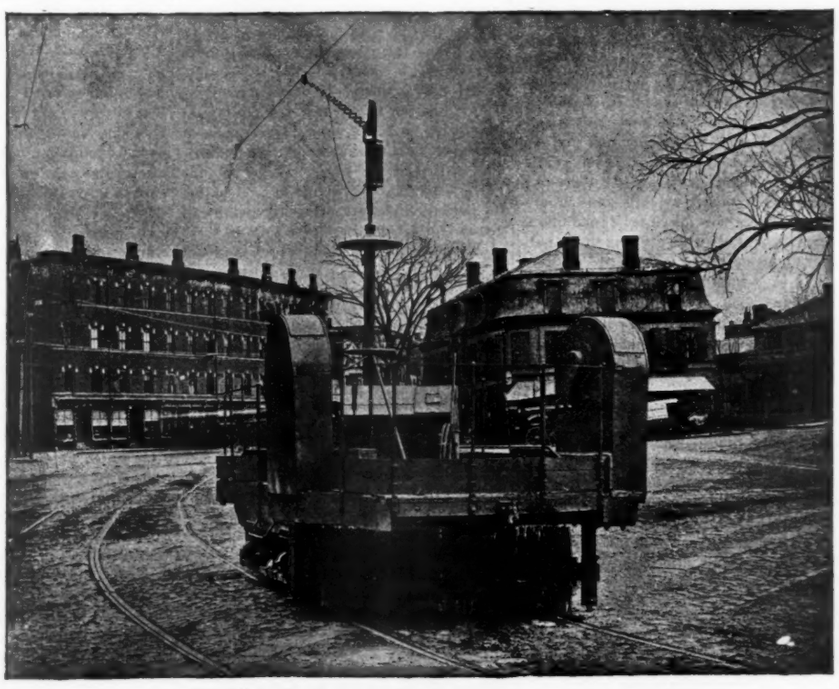
Messrs. E. E. Garvin & Company, the machinery manufacturers of New York, have recently removed to a new and much larger factory, corner of Laight and Canal streets, a small view of which is presented in this issue. These enterprising machinery manufacturers have become very popular in electrical circles, and their machinery is to be met with in every factory of importance. The machine illustrated in this issue is their No. 00 screw machine for bench work, specially designed for very small, quick work, requiring a light sensitive machine. The sliding surfaces are scraped to a perfect bearing, and the spindle boxes thoroughly fitted and provided with means of taking up wear, while parts subject to very severe wear, such as the turret mechanism, are hardened. The turret slide has an adjustable stop, and the block can be bound anywhere along the bed. The cut-off slide has two tool posts, with adjustable stop for each. For holding work they make a set of hardened spring bushings, ranging from No. 30 gauge down to the smallest. On these machines, all kinds of small shoulder screws, handles, knobs, washers, collars, pins, etc., can be turned out with great rapidity, accuracy and finish. The wire chuck, which acts with the machine in motion, is worked by the handle at the end of the head. One stroke of the lever releases the grip of the chuck and allows the wire to pass in through the hollow spindle, while the return stroke tightens the chuck and binds the wire. The swing over the bed is 6"; movement of the turret slide, 2"; number of holes in turret, 4" or 6" as desired; diameter of holes in turret, $\frac{7}{16}$"; diameter of hole through spindle, $\frac{5}{16}$"; weight, 55 lbs.

The Friction-Electric System for Street Railroad.

A car built in accordance with the plans and improvements of this company has been running for inspection purposes for several weeks past on the Third avenue street railroad in South Brooklyn. The chief improvement claimed by the company is in the mechanical application of the power, which is, in this instance, supplied by storage battery, one charging of the batteries supplying power sufficient to run the car 60 miles. The system is attracting considerable interest from street railway men, and bids fair to become a prominent factor in electric railway work of the future. The Weiss motor is used, although the company is not restricted to any special manufacture of motor.



Garvin & Co. Screw Machine for Bench Work.



Snow Broom for Use on Electric Railways.

Peoria, Ill.—Royal Electric Company, Peoria; capital, $40,000; to manufacture electric appliances; incorporators, N. A. Schaeffer, C. W. Robison and W. G. Randall.

Austin, Tex.—The charter of the New Birmingham Electric Light, Power and Street Railway Company was filed here. Capital, $50,000; incorporators, Capt. M. D. Mather and Dr. R. B. Wickes, of Austin, and W. J. Needles, of Philadelphia. The main object is to construct an electric railway at New Birmingham, in Cherokee County, Tex.

Detroit, Mich.—The National Electric Traction Company. Capital stock, $100,000, 10 per cent. of which is paid in. Hugh McMillan, Wm. A. Jackson and Frank E Snow are the principal stockholders of the corporation, the purpose of which is to manufacture and deal in all articles and things for use in the construction, equipment and operation of electric railways in Wayne county, Mich.

Fall River, Mass.—The Green and Wood Manufacturing Company have been formed, and will make wood supplies for electrical work.

Columbus, O.—The following articles of incorporation were filed in the office of the Secretary of State: The Bryan Electric Company, Bryan, Ohio; capital stock, $30,000.

Chicago, Ill.—The Western Valve Company, at Chicago; capital stock, $10,000; for the manufacture of valves and other steam-fitting goods and supplies; incorporators, E. B. Smith, C. P. Sawyer and G. M. Eckles.

East St. Louis, Ill.—United States Aluminum Company, East St. Louis; capital, $1,000,000; to manufacture aluminum and its alloys; incorporators, Robert M. Foster, John R. Trusdale, George C. Hackstaff.

St. Louis, Mo.—The St. Louis Thomson-Houston Electric Company filed articles in the Recorder's office yesterday increasing its capital stock from $150,000 to $500,000; assets, $325,900; liabilities, nothing.

St. Paul, Minn.—The Acme Electric Company. The principle place of business is St. Paul. Capital stock, $200,000; the incorporators are Charles F. Diether, Joseph I. Beaumont, Irwin J. Beaumont, Edward W. Johnson and Andrew Schoch, all of St. Paul.

Boston, Mass.—The Nebonset Electric Company. Capital stock, $50,000; J. B. Smith, president; J. W. Wattles, treasurer; E. P. Stetson, W. A. Stiles and C. A. Bowditch, directors.

Chicago, Ill.—Dearborn Manufacturing and Power Company, Chicago; capital, $150,000; for warehousing and light manufacturing; incorporators, G. Hines, C. W. Hubbard and W. H. Mathews.

San Francisco, Cal.—National Electric Company; the purpose is to buy, manufacture, use and sell grants, rights and privileges in electrical apparatus, and construct district telegraph systems; the capital stock is $200,000, of which $5,000 has been subscribed; directors, Thomas J. Craig, Moses Deutch, Henry L. Ackerman, H. S. Hunt and Eli C. Meyer.

Marion, O.—The Electric Light Company are to shortly increase the arc light plant recently installed for them by the Schuyler Electric Company.

Mankato, Minn.—The Mankato Gas and Electric Light Company; John F. Meagher, F. L. Watters, R. D. Hubbard and others; capital stock, $200,000.

Hempstead, N. Y.—The American Electric Illuminating Company, of Hempstead. Among the incorporators was Frederick E. Townsend, of New York City.

San Marcos, Tex.—The San Marcos Electric Light & Power Company has been organized by John Cook, J. S. Green, and L. W. Cook. Capital stock, $10,000.

Franklin, Mass.—A. H. Morse, president; M. W. Turner, treasurer; the same and H. W. Burgett, directors, as the Union Electric Light Co., of Franklin; capital, $20,000.

Chicago, Ill.—Marine Association, Chicago; capital, $300,000; to furnish heat, light and power; incorporators, Monroe L. Willard, Arthur A. Bliss and S. B. Gordon.

Streator, Ill.—E. B. Stiles president of the People's Electric Light Company, of Streator, filed a certificate of the increase of the capital stock of the company from $10,000 to $30,000

Madison, Dak.—The Madison Light and Power Company at Madison. Capital stock, $25,000. W. H. Jones, president; Geo. D. Winter, secretary and treasurer, and S. A. Jones, superintendent.

Lebanon, Ky.—The Lebanon Electric Light Company has been incorporated and has been granted an exclusive franchise for 15 years. Capital stock, $15,000. President, John Rubel; secretary, W. T. Goodnow.

Beardstown, Ill.—The Beardstown Electric Light and Power Company, at Beardstown; capital stock, $20,000; to furnish light, power, heat and water; incorporators, H. Ehrhardt, G. Bley and W. E. McCullough.

Chicago, Ill.—The National Telegraphic Press Association, at Chicago. Capital stock, $10,000; to furnish daily telegraphic reports and general correspondence; incorporators, Anthony P. Morris, Chester H. N. Brisco, and John Moffitt.

Saginaw, Mich.—The Saginaw Electric Light and Power Company, of Saginaw. Capital stock, $25,000. A. McIntyre, president; Hugh Smith, vice-president; R. Khuen, secretary and treasurer, and John Herman, superintendent.

Austin, Tex.—The charter of the Rusk and New Birmingham Street Railway Company was filed. Capital, $50,000; to operate cars with electricity, steam or horse power, as may be determined. Incorporators, S. Buzman, C. Berner, N. J. Owen, W. R. Slosson and W. E. Holmes, all of Rusk County, Texas.

Columbus, O.—The following articles of incorporation were filed with the secretary of state: The Van Wert Gas Light Company, Van Wert; increase of capital stock from $25,000 to $37,000. Change of name of the Massillon Schuyler Electric Light Company to the Masillon Electric Light Company.

Venice, Madison Co., Ill.—Electric City and Illinois Railway Company, principal office, Venice, Madison County; to construct a railway from the eastern approach of the bridge to be constructed by the St. Louis Merchants' Bridge Company through Madison County to East St. Louis. Capital, $50,000. Incorporators, Charles D. McClure, Granite, M. T.; John Whittaker, S. W. Cobb, C. C. Rainwater, St. Louis, and L. W. Rumsey, Hennepin County, Minnesota.

ELECTRICAL REVIEW

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, APRIL 13, 1889.

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What a great paper the Chicago *Inter-Ocean* has become under the management of the Nixons! A magnificent new building has just been contracted for at the corner of Dearborn and Madison streets, which will be lighted throughout by electricity, and will possess every modern improvement. Brains, enterprise and pluck have won the day with the *Inter-Ocean*, which is one of the most valuable and progressive exchanges that comes to the REVIEW office.

One can have a deed to *terra firma*, and there are boundaries to the waters near shore, but the air, and the sun and the stars are just about as much mine as yours, and we all have a right, according to recent decisions, to build up in that direction as far as we think we own. The question of ownership of the air is one that vexes the telephone men and the electric light and power men. We should advise them to lie down in peace together—or to be more correct, to build up together in peaceful neighborliness.

A new arc light motor, by a young New York inventor, may be looked for at an early day.

There was the usual street explosion in this city last week. We are a great and progressive town now.

American electricians will be numerous in Paris this year, and London will probably be visited by all of them. We bespeak a hearty welcome for them from their fellow-artisans across the water.

The primary battery fraud has arrived in Chicago. We presume the field there for dupes will be prolific for a while. Shares of stock can be had for $1.00 each, and the capital is a half million.

Once it was the quadruplex and duplex that annoyed the telephone people. Gray's buzzer and the gold and stock ticker threatened it with fatal paralysis. Then came the electric light which it was claimed was death on sight, and now the electric railway threatens not only paralysis and death, but utter extinction. Yet we think the telephone will survive all these annoyances.

The death is announced of Mr. Edward P. Allis, of Milwaukee. He was the proprietor of the large iron and engine works of that city, was a first-class mechanic, a manager of rare ability, and a friend of the working people, including the host of them who were in his own service and whom he aided in establishing homes for themselves. The REVIEW deeply regrets to hear of the death of this most estimable man.

How times change! The gas companies at one time viciously fought the electric light companies, and were the loudest advocates of burial of wires—possibly thinking that this meant extinction of what they then deemed an enemy to their business. Well, the preparation for the burial of electric wires began, and the result in New York has been to greatly embarrass our friends the gas producers. The thousand and one distinct stinks that paralyze us whenever the ground in this city is disturbed for any purpose, and the numerous explosions in subway manholes, have disclosed a condition of affairs that is not at all pleasing to the public or to the gas men.

The Indian Territory is to be opened up to settlers, and the telephone will be one of the first signs of modern civilization to enter Oklahoma. If the reports of the excitement in the West are true, we may expect to hear of President Mulvane, of the Missouri and Kansas Telephone Company, with Superintendents Smith and McDaniel, rushing to the scene and engaging in the work of planting poles and stringing wire. The M. & K. Company own the Territory for telephonic purposes, and as the Indians and settlers want this time-saving invention, they will be compelled to send to the Kansas City headquarters. The Territory is a new field for electrical work, but we predict the lively electric light man and seductive electric power representative will not be far behind their telephonic neighbor.

The advance in popularity of the electric light in Brooklyn has caused an unthought-of annoyance. The names of streets have all disappeared from the unused gas posts—and in many instances the posts went along—and it is only by constant inquiry that one is enabled to find a desired locality. This annoyance has so grown with the increased use of the electric light for street illumination, that the city officials have ordered street signs by the hundreds, and the streets will have their names tacked on corner houses and on the electric light poles wherever the latter are convenient. Now, if some electrician would invent a method of cleaning the streets he would find in the same city of Brooklyn a most ripe field, for her streets are the dirtiest and dustiest and the least cared for of any city in the United States—and probably on the globe.

USES OF MIRRORS.

The use of a mirror for reflecting the sun seems to run from the extremes of boyish roguishness in flashing the sun's rays upon the eyes of some companion—or even older persons, if the distance be sufficient—and then reaches to the other extreme of using it to flash the sun's rays for heliotrope signals in the coast survey or army service, or to measure the deflection of a galvanometer needle. But there is a vast middle space of practical usage of mirrors, apart from that of individual vanity, which are rarely thought of.

A gentleman in Boston, calling at an office in the upper part of a building, stated his intention of calling upon a man in a distant part of the city, and was told that this party had recently opened an office on the other side of the same street, and in the upper part of a building of the same height.

On looking across to the opposite window, the gentleman was seen, hard at work and too busy to look up. However, a large mirror was unhung in the toilet room, and the sun's rays flashed upon his face in a manner that startled him and dazzled his eyes, first causing him to jump and blinding him.

At first he was indignant at the improper liberty taken with his visual organs, and looked out of the window as fierce as a forty-pounder, threatening and breathing out slaughter upon the youngster should he be in sight. A few gesticulations, however, soon made the party across the street understand that he was to be called upon.

In the boyhood's days of the writer, he remembers looking into a new pump which had been thoroughly spiked, the night before it was to be placed in the well, by means of some rocks which were pushed in about midway and wedged against each other.

Various plans for their removal had been suggested, the most practicable of which was to saw the pump in two and join it together again *somehow*. The writer suggested that a mirror be brought, and the sunlight flashed in to reveal the position of the stones. A bar of wrought iron was bent to a hook, suitable to the condition of affairs, and extricated the stones one by one, the mirror showing the openings of light so that the person could work efficiently and intelligently.

Objects lost in wells have been disclosed by means of the sun's rays thrown down upon them by mirrors. Dark basements in cities are lighted by means of mirror surface of total reflecting prisms, made out of decidedly cheap glass, and held in proper position in racks placed in alleyways, under gratings forming a part of the walk.

STEAM ECONOMY.

The question how best to economize fuel in an electric light plant is one of vital importance, and one which is receiving a large amount of attention. An experiment in an unusual, if not an entirely new, direction seems of so much promise as to be worth mentioning.

The Merchants Arc Light and Power Company of Chicago has, at 329 Dearborn street, a plant of four 20-light Sperry dynamos. These generators are run by a New York Safety Engine, 14x16, making 216 revolutions, with 90 lbs. boiler pressure.

The building is seven stories in height, and has a large amount of printing and other machinery, for which a C. H. Brown, Fitchburg, Mass., 15x38 engine furnishes power. The speed of this engine is 70 revolutions, has an indicated horse power of 150, and cuts off at one-quarter with the governor at rest.

Mr. J. W. Stevens, the electrician and engineer of the plant and building, conceived the idea of economizing coal by running the Brown engine with the exhaust from the other, and, although his ability to accomplish this was doubted by engineers and electric light men generally, the president of the company had faith enough in Mr. Stevens to encourage the project.

The result, as shown by actual weighing of the coal, is a saving of about 700 pounds of Pittsburgh coal in four hours' run, from two to six o'clock P. M., the only time when the two engines are run at the same time. The pressure in the receiver between the two engines is 15 pounds.

In an ordinary run of 12 hours, as many plants are run, the saving would be over one ton of coal.

Mr. Stevens is running his two steam plants in this way as an every day affair, and takes pleasure in showing it to the curious or incredulous who may drop in between the hours named on any working day.

NO ROYAL ROAD TO ELECTRICAL IMPROVEMENT.

Electric railway improvement is at a very low ebb in England, and is apparently doomed to the same inexplicably slow progress that marked the advent of electric lighting there ten or more years ago. Our esteemed contemporary, London *Electrical Review*, wailingly but forcibly contrasts tramway progress there and here, in commenting as follows on the announcement that six new lines had been begun in one week in this country:

"Here, if we can publish anything relating to electric traction once in three months, it produces an impression upon the reader's mind that things are moving."

Capital is proverbially slow in legitimate enterprises in England, because such projects are always in the hands of the real conservative element, who are always too slow for their own good. For wildcat schemes capital is always ready to make a headlong spring in England in the same wild hope that filled the breast of Icarus, and like him drop into the sea. In America, on the other hand, we are all under the sway of a feverish and uncontrollable longing for improvement, something better either in merit or luxury, and when any project is mooted having a plausible look, capital, impelled by the same fever of improvement, is always ready to take a hand and help along.

Poeta nascitur, but electric railways are the outcome of trial and tribulation. Much has had to be done, undone, and done over again. The history of the trials and failures would be a long one to repeat; but in such things as the evolution of complete and practicable electric railway systems, the battlements of success are scaled only by making a ladder of the failures. This has been done, and today the list of completed electric railways shows a formidable rivalry to the now old-fashioned use of hippo-muscular energy. The owners of tramways in England ought to wake up and prepare to take care of the shillings which electrical traction, energetically exploited, will coin for them.

NEW BOOKS.

The Voltaic Accumulator. — By Emile Reynier, translated from the French by J. A. Berley, 1889.

This is a practical treatise on storage batteries, and is written in a style which makes the subject easy of comprehension by all, while still giving all technicalities in the accurate manner demanded by advanced students. It is far the best work on the subject published since Planté's excellent book. Four divisions constitute the volume, most lucidly setting forth the principles underlying the accumulator, then a chronological description of all known types, both autogeneous and heterogeneous formation of lead oxides, and miscellaneous types; next the technology of the subject, and finally the various practical applications of the accumulator. The book is admirably written, and ought to be in the possession of every student of electrical science. It presents the facts, and the reasons for them; the actual dimensions and performance of many different types of storage batteries, the points of merit and the deleterious features where they exist, and in short contains all the elements of a standard work of reference, which it is sure to become.

For sale at this office. Price, $3.

The annual meeting of the Electric Club will be held at 6 o'clock P. M., Thursday of next week (April 18th). The polls for the election of officers will be kept open for two hours.

THE NEWS.

Interesting Electrical Information Sent in by our Correspondents.

OUR BOSTON LETTER.

Electric Club Matters.—The rooms of the Electric Club have been the center of attraction for the past week. On Monday evening the monthly meeting was held and routine business transacted. On Tuesday the house and entertainment committee, of which Mr. Jno. C. Wilson is chairman and Mr. Otis K. Stuart secretary, issued a notice to members of the club in regard to the opening of the buffet, which has since been liberally patronized. On Saturday evening Dr. Arthur de Bausset entertained a large gathering of members at the club rooms with a description of his aerial ship, an account of which appears below. To-day the meeting of the Electric Exchange is being held at the club rooms, and Mr. Marsden J. Perry is to deliver an address on "Economical Steam Plants for Electric Lighting Stations." Altogether the Electric Club may be said to be booming, and the officers and committeemen are to be congratulated on their energy in carrying on the work.

Important Removal.—Almost the last to leave the now-being-dismantled Hancock building, 178 Devonshire street, was the portly and popular Mr. Frank Ridlon, who, with the various interests which he represents, including the Sun Electric Co. and the Baxter Electric Manufacturing and Motor Co., is now to be found comfortably installed in the pleasant offices in the *Estes Press*, 192 Summer street. The *Estes Press* is in close proximity to the Hathaway building, 620 Atlantic avenue, which has become one of the electrical headquarters of the city since the Thomson-Houston general offices were removed there last fall.

Dr. de Bausset's Lecture.—In his lecture before the Electric Club, Saturday evening, Dr. de Bausset of Chicago first described his metallic vacuum air ship, which is to make a tour of the world, including a short stop at the north pole. The ascentional power will be gained by a vacuum instead of hydrogen gas, as in balloons. The "Arctic Explorer," when completed, will be 654 feet long and 144 feet broad, and will weigh, without its car, about 260,000 pounds. The vessel, as designed, presents the form of a cylinder, with two conical ends. The cylinder is divided into many air-tight compartments, each of which may be exhausted of its air, and, by an unequal distribution of this process, the vessel may be inclined and projected at any desired angle, and above or below the horizontal. The exhaustion of the cylinder will be accomplished by means of dynamo power and the aeroplane, as it is called, will be moved backward, forward or sidewise by a simple apparatus under the control of the engineer. The airship will be propelled by exhausting air screws, capable of exhausting 300,000 cubic feet per minnte, and this will give a speed of 70 miles an hour. Power for driving the screws will be obtained from an electric motor, receiving its current from accumulators sufficient to give 100 horse power. The inventor explained his project in great detail, replied to a number of questions, and was cordially thanked by a standing vote of the club. M. de Bausset is at present endeavoring to raise money with which to build the "Arctic Explorer." About $90,000 will be required to construct the first ship, and this sum is being obtained by the issue and taking up of the capital shares of the company.

The Review's New Office.—The New England office of the ELECTRICAL REVIEW is now located in the new building 192 Summer street, where a warm welcome will be extended to all its friends.

With Greene & Wood.—Mr. Lewis C. Bass, formerly of the Woonsocket Spool and Bobbin Co., where he has made an enviable reputation among electrical people for the superior quality of work turned out, has recently been appointed treasurer and manager of the Greene & Wood Manufacturing Co., of New Bedford.

Notes.—The current number of the *Technology Quarterly* contains an article by Mr. H. E. H. Clifford on the "Efficiency of Small Electro-motors." Mr. Moody, of the Thomson Electric Welding Co., Mr. Edward Blake, of the Sprague Electric Motor Co., and Mr. Anthony C. White, of the American Bell Telephone Co., are among the outside lecturers of the Institute of Technology.

T. W. S.

Boston, April 8, 1889.

OUR CHICAGO LETTER.

Electrical Mining.—The new Sperry electric coal drill, which made such a racket at the recent exposition here, is to be exploited by a company recently formed, with a capital of $100,000. The incorporators include the president of the Wilmington Coal Company, the inventor and the patent attorney.

Featherweights Scrap. — Seven of the Western Union messengers on the night delivery here struck the other evening for a raise in wages—wanted $3.50 per week and half the Sundays off. Mr. Gould's representatives could see no reason for thus wasting his money, and other boys, pending negotiations with the Lilliputians, were put in their stead. Then there was war, and these readers of "The Sanguinary Butcher, or Buckets of Blood" style of literature had several bouts at name-calling and wicked threats. Bean-shooters and putty-blowers were in active demand, but the police report the crisis passed. The Boulanger who generalled the belligerents was arrested.

At Akron, O.—Judge E. H. Green was asked by the Telephone Company at Akron, O., to grant an injunction against the electric street railway for extending its tracks, on account of the pestiferous induction which makes it impossible for many of the subscribers to use their instruments.

He Refused.—The Judge refused to grant the prayer of the petitioners, inasmuch as the proprietorship of the air was not clearly established. That was on the 30th of March. Next day an injunction was asked by the Missouri and Kansas Telephone Company to restrain the Topeka Rapid Transit Street Railway Company, the Thomson-Houston Company and A. H. Hayward, at Topeka, Kansas, from applying the electric current to any of its wires, cars or motors in the city.

From a Tree Top.—To one who is up a tree it looks as if this was to be the commencement of a long and bitter war. The telephone and the electric railway are two diametrically opposed enterprises, so to speak, neither of which we can get along without—they have both come to stay, and sooner or later must make a date for the performing of the world-renowned and thrilling act known as the Lion and the Lamb.

Two Compromises.—There are two methods by which peace could be honorably won to both, but one of these is objectionable to and the other is disliked by the companies. One is sometimes alluded to as metallic circuits—see? The other is known to a few municipalities, and occasionally spoken of in works on electrical natural history as the marmot, woodchuck or mole remedy. Both are good medicine for the symptoms mentioned.

Water and Oil.—It is often said that a man of science seldom makes a good business man. The characteristics necessary for the two followings are as unlike as oil and water. Mr. George Cutter, who has just left the Thomson-Houston Company, to do for himself and Mrs. C., has not yet located, but told me yesterday that he had already done a good business, and was at present carrying his office in his hat. He will be heard from early, and is an exception which proves the rule.

Electrical Surgery.—Charles Nier, of Scranton, Pa., on the 14th, ran a needle into his foot, and all other means of relief having failed his foot was taken to an electric railway plant dynamo, and the needle was drawn out in 15 minutes by the magnetic power of the machine Charley, it is perhaps superfluous to add, was with the foot at the time. The needle was quite diminutive as compared with the story.

Chicago's Club.—The Club's secretary has notified its landlord that the Club will move. The quarters selected are on Adams street, next to the finest restaurant in Chicago, opposite the post office. Two floors will be occupied, and the next time any of the Eastern electricians favor us with a visit we shall have a home to which we shall not be ashamed to welcome them.

C. C. H.

Chicago, April 6, 1889.

OUR WASHINGTON LETTER.

Signal Office Removal.—The Signal office was moved to its new building in the western part of the city a few days since. Telegraph lines had been extended to this place some months ago, in anticipation of some prohibitory congressional action, otherwise the weather reports would have suffered serious derangement.

Roger's Visual Synchronism.—Representatives of the Roger's Visual Synchronism Company have been getting estimates for a two-wire telegraph line from Boston to Washington, with a view of equipping it with Roger's multiplex system, by which, in conjuction with his synchronism devices, he claims to be able to transmit ten messages simultaneously, and at full speed over one wire.

Electric Tooth-Pulling.—An enterprising electrician of this city proposes to render tooth-pulling painless by screwing a good-sized plug of soft iron into the tooth and then quickly jerking it out, molar and all, by closing the circuit through a powerful electro-magnet placed near it—and he wants to organize a ground floor syndicate to introduce his invention.

A Satisfactory Electric Light Plant.—The incandescent plant, 1,112 lamps, installed by the Brush Company in the Interior Department, has been completed, tested, found entirely satisfactory in every respect and paid for.

Didn't Find His Health.—C. W. McNett, of the Thomson-Houston Company, who went to Los Angeles, Cal., last December on a health seeking vacation, has returned to this city. He advises all persons looking for a health resort to stay away from Los Angeles.

G. C. M.

Washington, D. C., April 6.

SOUTHERN NEWS.

Pleased with the Electric Light.—On the 16th the city of Clinton, Iowa, was for the first time lighted by electricity. The people went wild over the event.

Electric Lighting.—At the regular meeting of the Board of Aldermen, Charlotte, N. C., the extension of franchise asked by the electric light company was refused on the ground that the franchise asked was an exclusive one. The D. A. Tompkins company then asked the privilege of erecting electric light poles, and stretching wires, also to lay underground wires. Their petition was referred to the committee on lights.

At Portsmouth, Va., application has been made by the Edison Electric Light Company, to be allowed to erect poles and wires under the direction of the Street committee.

The city council of Huntington, W. Va., is negotiating for an electric light plant probably with the Brush Electric Company.

A proposition has been made to the town of Richmond, Ky., to establish an electric light plant.

The Electric Light and Power Co., of Chester, S. C., has been incorporated with a capital stock of $5,000.

Fire Alarm Contract.—The city of Anniston, Ala., has decided upon the establishment of an electric system of fire alarms, to cost $1,500, the annual cost of maintenance to be $2,200.

With Pomp and Ceremony.—The progressive town of Hickory, N. C., last week turned on electric lights amid the cheers of its inhabitants and the strains of a brass band. The electricians who erected the works at Hickory are Messrs. T. R. Cooper and Alex. Henderson, representing the Brush Electric Light Company.

Statesville, N. C., Lighted.—The city of Statesville, N. C., has an incandescent plant of 100 lights just put in working order.

In St. Louis.—The municipal assembly of St. Louis approves of the electric light contract recently made with Charles Sutter and the Laclede Gas Company. The former gets the most of the arc, and the latter the bulk of the incandescent system. It is claimed that $65,000 will be saved annually to the taxpayers. The contracts go into effect on the 1st of January, 1890.

Lions and Lambs.—The conduits of the National Subway Company will be used by all the electric companies. The subway company will begin work at once. St. Louis has granted franchises now for electric lighting, subway conduits and elevated railway. The town is keeping up with the procession.

Arc Electric Lamps Operated by Underground Wires.

The official experiment of operating arc lights in New York by underground wires occurred last Saturday night, and assisted in illuminating Broadway and Sixth avenue from their intersection at Thirty-fourth street down to Twenty-third street. The electric lamps were put up on top of the old lamp posts. The current was supplied by the United States Company, and the cable manufactured by the Standard Underground Cable Company. Dr. Schuyler S. Wheeler, the electrical expert of the Subway Board, conducted the experiment, and was very much pleased with the result.

Gifts to the Electrical Students at Cornell.

TO THE EDITOR OF ELECTRICAL REVIEW:

The electrical engineers of Sibley College, Cornell University, returned from their annual tour of inspection this week. Among the many pleasant recollections of the trip was the visit to Thomas A. Edison's laboratory at Orange, N. J. They were royally treated, and the students sang a number of college songs into the phonograph, and finally gave down a hearty Cornell yell, which was accurately repeated by the phonograph to the great amusement of the party. The cylinder upon which the impressions were made was kindly presented by Mr. Edison to the University. Among the gifts received by the electrical department of the University during the trip were electric motors from the Eickemeyer Electric Works at Yonkers, N. Y; the C. & C. Motor Company, of New York, and the Excelsior Electric Motor Company of Brooklyn, N. Y. A storage battery of 20 cells was also received from the Anglo-American Electrical Company of New York City.

F. C. P.

Ithaca, N. Y.

PERSONAL.

Mr. J. A. J. Shultz, the St. Louis belt manufacturer, is a visitor in New York this week.

Mr. Everett Morss, of Morss & Whyte, was one of the Boston visitors in the metropolis last week. His firm is busily engaged in electrical manufacture at Cambridgeport, Mass.

Dr. Alexander Graham Bell, the inventor of the telephone, last week arrived at St. Augustine to attend the entertainment at the Alcazar, given by the deaf children of the institute.

Col H. C. Davis, ex-president of the Electric Club, returned from London Sunday last, and will remain in New York about six weeks, when he will again go abroad to spend the summer.

Mr. W. E. Huntington, formerly general manager of the B. & O. messenger service of New York, is now in Buenos Ayres, and a host of friends will be glad to learn that matters are going well with him.

Commodore Chas. A. Cheever, who is devoting much time and attention to the development of the phonograph at 257 Fifth avenue, has purchased a handsome yacht and will spend the hot months on the water.

Col. Gardiner C. Sims, who has been in Philadelphia for a couple of weeks looking after the starting up of the new Edison station, was in New York last week, and reports the engine business as rushing as ever.

Mr. Fred. W. Royce, of Washington, has given up a proposed trip to Paris this season, and remains at home collecting royalties on his invention of a new method of buttoning shirt collars, from which he is reaping a well-deserved remuneration.

Mr. W. D. Sargent sails from New York on the French steamer "La Gascogne," Saturday of this week at 3 P. M. He goes to the Paris Exposition to represent the telephone interests of this country, and will have charge of the American telephone exhibit.

Mr. R. T. McDonald had the top of his head severely cut by some falling bricks at the new building of the Ft. Wayne Jenney Electric Light Company, in Ft. Wayne, last week. It takes a good deal to knock out a gentleman of Mr. McDonald's strength and activity, but when a portion of the building fell on him he had to give in. Fortunately the injury only affected the scalp, and Mr. McDonald, his friends will be pleased to hear, was able to be out again in a few days.

MANUFACTURING NOTES.

The Munson Belting Company, through Mr. J. H. Shay, has recently supplied the Brush Electric Company at Minneapolis, Minn., with one 68-inch belt, 141 feet, double thickness; also, one 36-inch belt and one 31-inch belt.

New Haven Clock Co.—The New Haven Clock Co., of New Haven, Ct., have been awarded the contract for furnishing the new Auditorium hotel at Chicago with their new electric messenger and guest calls complete; also for the Sterlingworth Inn at Lakewood, N. Y.

The Thackara Manufacturing Company.—This widely known Philadelphia house is devoting a great deal of attention to the manufacture of artistic electroliers and combination fixtures, and its efforts are meeting with marked success. A new price list has just been issued, and as it is stated that a material reduction in the price of certain popular fixtures has been made, it will be sent for very extensively by the numerous users of electric fixtures.

The end wall of the Westinghouse electric plant in course of construction at Pittsburgh fell without previous notice and buried three workmen. Two of these, O'Brien and Burgess, were badly injured. Brick walls kill more people than electric currents.

Topeka, Kan., has the largest electric railway system in the world, and is very proud and happy. There are 16½ miles of track in operation, and a speed of 15 miles an hour can be attained. If New Yorkers want rapid transit, remarks the *Tribune*, they can get it by moving to some little Western town.

Telephonic News

*** The telephone exchange at New Haven was moved into new quarters last week, under the direction of Superintendent Baker.

*** Representative Eckels has introduced an act in the Delaware Legislature taxing telephone companies $10,000 a year. The bill prohibits the companies from raising their rates in consequence of such tax.

*** A new double glass insulator is being used by the American Telephone and Telegraph Company. It is called a "transposing" insulator, and is particularly adapted for transposing the long distance wires for the purpose of preserving electrical balance on the lines.

*** The long distance telephone is playing an important part in France just now. The Paris friends of Gen. Boulanger (who has run away to Brussels) are in constant communication with him by means of the telephone, and are enabled to confer as freely as if Boulanger was in his own home in Paris.

*** In addition to the 24 call rooms at present available in London, the United Telephone Company will this month open additional rooms at Richmond, Willesden, Green, Kew Bridge, Forest Gate, Shepherd's Bush, Norwood, and Lewisham, and preparations are being made for stations at Streatham Hill, Brixton (second), Sydenham, Hampstead and Leytonstone. Subscribers make use of these call rooms free, and non-subscribers at a charge of sixpence.

*** The Missouri and Kansas Telephone Company petitioned Judge Guthrie for an injunction restraining the Rapid Transit Railroad Company of Topeka from operating its electric plant, claiming that the lines of the two companies ran near each other in several localities and that those of the former would be seriously injured by induction. Subsequently the attorneys for the companies patched up an agreement and the petition was withdrawn. The rapid transit people expect to begin running electric cars this week.

*** The Central Union Telephone Company which controls the territory in Indiana, for the use of the Bell patents, has begun the work of restoring its business, which was seriously affected by the passage of the law restricting rentals by the legislature in 1886. Within a year from the taking effect of the law the exchanges were discontinued in most of the cities of 5,000 and less. The loss of revenue to the telephone people during this voluntary suspension of business has been large. The last legislature repealed the law fixing an arbitrary rental rate of three dollars per month, and the company now propose to return to its old rate in cities of this size, which is six dollars per month for residences and four dollars per month for business houses.

*** "A few weeks ago," says the manager of the Denver telephone exchange, "we were short of operators, and on the spur of the moment I inserted an advertisement in each of the papers, for one time, for two young lady operators to apply at the office on the following morning. To my utter amazement I found on arriving at the office the next day 147 applicants of all kinds and descriptions, who accosted me with questions which, should I have answered, it would have taken until doomsday. There was one young lady among the applicants who was of French nationality, and when she spoke I told her she was not fitted for the position owing to her half-broken language. She became very much incensed and it required considerable knack and diplomacy to get her out of the office without a scene."

The Interesting Electrical Work at the New Telephone Building.

About a year ago the REVIEW published several views of the new telephone building on Cortlandt street, New York, with description. These presented excellent pictures of the switchboard, back and front, as well as a general view of the large exchange room. Our esteemed contemporary, the *Scientific American*, published last week several additional views, which we are pleased to present this week, as they will particularly interest our telephone readers and show the advance that is being made in this city in the line of securing modern telephone facilities. The cellar is excavated under the sidewalk and roadway of the street. In its front end are the terminals of several subway conduits

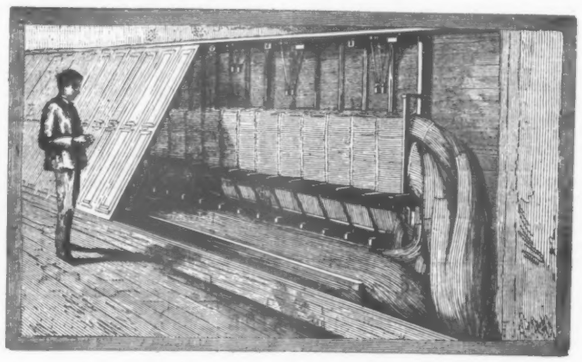


FIG. 2.—VIEW OF MASS OF WIRES CONNECTING WITH BACK OF MULTIPLE SWITCHBOARD.

partially occupied by cables. At present 49 lead-incased cables enter the building (Fig. 1). Each cable contains about 100 wires, arranged in pairs, the wires of each pair being twisted about each other.

The object of this disposition is to ultimately use the wires in complete metallic circuits, the twisting of each pair being for the purpose of reducing induction. At present ground circuits are generally used, so that nearly one-half of the wires in these subways are idle. The cables run thence to the testing room (Fig. 4).

In Fig. 2 a view is given of the rear of the board, showing the general arrangement of cables. The division into sections can here be traced, one section and part of another occupying the foreground of the cut. At the top the induction coils are seen, which form part of the operator's talking and listening apparatus. Hanging from pulleys the counterweights can be seen which support the weight of the swing transmitters.

On the floor of the room are three desks with spring jack connections, telephones, etc. At each of these sits a monitor, who

FIG. 1.—VIEW OF SUBWAY TERMINALS, SHOWING CABLES ENTERING THE TELEPHONE BUILDING, NEW YORK.

can connect at will with any of the operators or with her group of subscribers, so as to hear all communications between operators and subscribers. Thus he watches their work, receives from them any notices of fault, and can be asked by the operators for information. The three monitors can also communicate with each other.

In the rear of the cellar is the lighting plant for supplying current for nearly 800 lamps contained in the building, as well as for ringing subscribers' bells. It comprises two Edison and two Electro-Dynamic Company's dynamos, driven by Buckeye engines. The generators are so arranged that they work in connection with a storage battery, charging it and also supplying lamps with current. At night the battery is relied on for lighting. It comprises 580 cells (Fig. 3) arranged in 10 series, giving an output of 300 amperes at about 125 volts potential.

How Telephone Lines are Worked in Scandal Cases.

Mr. J. P. McKinstry, of the Erie Telephone Company, Cleveland, Ohio, is reported in a recent interview as follows:

"I notice that the Connecticut legislature," he said, "has passed a bill imposing a fine not to exceed $500 on any person who shall make a connection by wire or otherwise with any telegraph or telephone wire not owned or leased by such person for the purpose of obtaining information or listening to the transmission of messages. The bill was asked for by the Connecticut Telephone Company, because in a scandal case at New Haven some months ago important evidence for the husband had been obtained by tapping a telephone wire and listening to a conversation between the wife and her admirer. We had a case here a short time ago that just fits the one which caused this enactment. A gentleman of this city who stands high in business and social circles called on me and supplemented a little preamble with a request, which I was of course compelled to refuse. His home is connected with our main office and he asked to have a telephone attached to the line at an intermediate point. His object could not be concealed and he admitted that he wanted all conversations carried on through his home. I did not learn whether it was an extraordinary case of jealousy or whether the husband suspected his wife of relations with some particular admirer, but I do know that he was badly disappointed on learning that we would not be a party to the scheme. Operators, too, have been bribed by people who endeavor to get information in this way," Mr. McKinstry continued.

"Only a short time ago we were compelled to discharge an operator here on this account, and another case, that of a young lady at Minneapolis, was similar to the one which caused the legislative enactment in Connecticut. She figured in a case where one of the heads of the fire department was seeking a divorce. The business of tapping wires, however, is worked most extensively, and our linemen are on the lookout for the connections right along. All that is necessary is to attach a wire and instrument to that of any telephone line."

"Yes, we are looking for more trouble from the wires used in connection with the electric motors," Mr. McKinstry said in answer to a question. "The time is not far off when these street railway companies will attempt to run cars through the down-town streets by means of electricity and then every one of our wires must be adjusted to them. We have just got through fixing the wires in the East End, and in every case we were compelled to put in return circuits instead of grounding them. We expect to work several telephones on one circuit of this kind, but even at that the trouble will be extensive."

New Telephone Offices in Pittsburgh.

The Telephone Company, of Pittsburgh, has purchased the Lutheran Church building on the corner of Seventh avenue and Cherry alley, and purposes to erect its offices, etc., there, on the site now occupied by the church building, and will also cover the ground now occupied by a dwelling house in the rear of the church. The latter is, as antiquity goes west of the Alleghenies, quite an old building, having been built in 1840. It seems to be well preserved, but is not considered just the correct thing for the telephone business. The lot is 66x100 feet, and the price paid was $58,000.

The company will make the new building it proposes to erect the central office, and it will be a good one. No specifications are furnished, as the construction will not begin for some time, but the cost is fixed at $75,000, and it is likely to be the precursor of several fine structures on that avenue.

The Pittsburgh *Post-Despatch* discourses as follows: After the "glad tidings, how that the promise which was made unto the fathers, God hath fulfilled the same unto us their children," have been declared from that corner for 49 years, it becomes the headquarters of an institution that will send tidings both glad and sorrowful, and in nearly as many, if not the same tongues, as those bestowed on that great day of Pentecost when, as now, "there appeared unto them cloven tongues as of fire." By the way, have they telephones in Jerusalem? Had there been a few phonographs in that building on that day when Parthians and Medes, and Elamites and the dwellers in Mesopotamia and in Judea and Cappadocia, and Asia, Phrygia and Pamphylia, in Egypt, and in the parts of Lybia about Cyrene and strangers of Rome, Jews and proselytes, Cretes and Arabians were heard speak in their own tongues the wonderful works of God, we would listen to them with more amazement than did that multitude to St. Peter, for at that time miracles were considered sort of matter-of-fact affairs, while now their assertion would set scientists to work with a vim unknown at any time since the day the reign of the Baconian philosophy was established.

The Finances of the American Bell Telephone Company.

The following are the earnings of the Bell Telephone Company in detail:

Earnings.	1888.	1887.	1886.
Rental of telephones.	$2,453,379	$2,264,823	$2,109,492
Dividends	1,213,856	1,013,086	844,555
Extra ter. and branch lines	78,711	80,443	78,109
Telegr'h commission.	21,164	19,962	16,681
Interest	90,466	70,295	34,960
Miscellaneous.	7,639	4,595	13,600
Totals	$3,865,118	$3,453,027	$3,097,000

Expenses.	1888.	1887.	1886.
Expenses of operation	$274,442	$342,205	$230,968
Legal expenses	222,257	207,679	210,550
Interest and taxes.	207,212	139,174	82,458
Commission	467,471	433,578	404,111
Royalty	10,000	11,000	14,501
Concessions	207,790	189,765	207,128
Miscellaneous	61,739	19,027	
Totals	$1,450,913	$1,242,430	$1,149,717

*** In the *Electrotechnische Rundschau* for March will be found an article by Dr. Wietlisbach, of Berne, on the subject of "Long Distance Telephony." The article is too long to reproduce in full, but the author comes to the following agnostic conclusions: "There is, up to the present day, no formula known which will give the limiting distance for telephone work with any approach to accuracy; no reliance can be placed on data obtained from any experiments yet made; the limit for overhead copper lines has never yet been reached."

Underground Telephone Work in Baltimore.

The Chesapeake and Potomac Telephone Company has prepared plans for and made preparations to commence work on an extensive system of underground wires in Baltimore just as soon as an ordinance giving the necessary authority, which is now pending in the city council, becomes a law. This ordinance will give the company the right to lay conduits and cables under any streets, alleys or highways in the city, according to plans first approved by the city commissioner, and provides for the removal of pole lines from streets in which underground wires are placed *after two years* from the commencement of the work, except in cases where distributing poles are necessary. The company will be required to pay annually for the privileges of this ordinance 30 cents for each lineal yard of the first four miles of conduit, and 20 cents per lineal yard for all over four miles, and to provide space, free of charge, for a cable for the official use of the police and fire alarm telegraph, and must give a bond of $10,000 for the faithful performance of its obligations. The new building erected by the company on St. Paul street has been ready for occupancy by the central office for some time, the delay in moving into it having been caused by the lack of right of way for wires leading to it. It will be fitted up with the Western Electric Company's multiple switchboard, with all the latest improvements, so arranged that single and metallic circuits can be readily handled. Three thousand wires will be run out of the building, the southern lines going down St. Paul, across Baltimore street, and east and west on German street, and the northern lines up St. Paul street and east and west on Lexington street. Patterson cables with No. 18 conductors, in pairs, will be used. President Bryan favors the plan of solidly imbedding cables in asphalt in all cases in which the future needs of the business can be foreseen, and there are no obstacles in the way of getting the work done in this manner. In some of the narrow, crowded streets of Baltimore, it would be impracticable to handle the numbers of large reels, with many cables laid out on the ground, and to keep open the long stretches of trench which almost closed whole squares to traffic in this city, and, wherever necessary, open conduits with suitable manholes will be laid. It is proposed to use a creosoted pump log tube of white pine or spruce, four inches square, with two and one-half inch bore, provided investigations now being made satisfy the officers of the company that the creosote used to preserve the wood will not injure the leaden cable sheathing. The plan covers about 10 miles of conduit, 40 miles of cable, and the work will cost $350,000.

Telephone Company Defeated.

A RESTRAINING ORDER ON AN ELECTRIC STREET RAILWAY COMPANY REFUSED.

The first case in court involving a conflict between electric street railways and telephone companies, in regard to their respective rights to earth and air on city thoroughfares, was decided in Akron, Ohio, last week. Judge E. H. Green refused to grant the Central Union Telephone Company an injunction restraining the Akron Electric Street Railway Company from extending its line in the city. The telephone company claimed that induction from the electric railway wires makes it impossible for many of its subscribers to use their instruments. Ex-Congressman John A. Wise, of Virginia, appeared for the Electric Railway, and A. A. Thomas, of Chicago, for the Telephone Company. The latter gave notice of appeal.

*** The telephone companies of New York State are insisting on a restriction of the use of the lines to subscribers, and have recently issued "a notice to the public," to be hung up at each instrument, saying, "this telephone is private," and that non-subscribers will not be permitted to use it under any circumstances. If important, the subscriber may use it for them. Non-subscribers are referred to public stations.

Rental of Telegraphic and Telephonic Lines in Paris.

A decree has just been published as to the annual rent which the city of Paris is authorized to collect for the establishment of telegraphic and telephonic lines, which is fixed for each double conductor at 1 franc per 100 metres. This rate is reduced one-half for single conductors. This rent is calculated according to the real length of the double or single conductor by an indivisible fraction of 100 metres. The lines used exclusively as fire warnings and connecting private establishments to the municipal establishments, in case of fire, are only chargeable 1 franc for each conductor leading to these warning instruments.

The Western Union Company's Injunction Suit.

In the United States Circuit Court, last week, before Judge Wallace, came up the case of the Wes ern Union Telegraph Company against the Mayor of the city of New York and the Subway Commissioners. Gen. Wager Swayne and George H. Fearons appeared for the company, John M. Bowers, of Platt & Bowers, for the Subway Commission, D. J. Dean, of the Corporation Counsel office, for the Mayor, Col. W. J. Wilson, of the firm of Wilson & Wallis, and Hamilton Wallis for the receiver of the American Rapid Telegraph Company.

The first day's proceedings were arguments to prevent the Board of Electrical Control from interfering with overhead wires of the Western Union Company until a final decree of the Court had been obtained. In other words, arguments were made to have the temporary injunction, a notice of which was served on Mayor Grant, made permanent.

Gen. Swayne opened proceedings by reading several affidavits from the company's employés. The first one was that of Walter C. Humstone, superintendent of the company in New York. This affidavit set forth that since September, 1886, many cables had been attached to the elevated railroad structure. All these cables contain 19 wires each, with a few trifling exceptions. With the exception of a short distance at Chatham Square none of these wires are as low as the lower girders of the structure. They do not interfere with the railroad company, nor with the street, or with traffic of any kind. He had heard of no complaint of the presence of the wires on the roads. The cables were at the present time in good condition.

An affidavit of the vice-president of the Western Union was also read, setting forth that as soon as informed of Judge Wallace's order he gave instructions that no more poles be erected nor new cables laid, but that everything should be left as it was when the order was issued.

Gen. Swayne in opening his argument, said it was the desire of the company he represented to live amicably with the city. More affidavits were read showing the damage done to cables laid in the lower portion of the city. Two cables of 60 wires each were placed in subways through lower Broadway in February, 1888.

In April of the same year 20 conductors parted near Exchange place. An investigation showed that they had been destroyed by the steam heating pipes. They were immediately repaired. In May the cable was extended to the Produce Exchange and to the new office of the company on Broad street, to connect with the Stock Exchange and the ocean cable offices.

During every month since that time conductors have failed to a large number, and in their failure was found to be due to the steam-heating pipes.

In the course of his remarks Gen. Swayne said, among other things: "We occupy the highways and streets of the State and city in accordance with the adjudication of the State. We exist under the same circumstances as does the elevated railroad. We have acquired real estate as they have. In fact, having the rights I speak of for over 20 years, we are beyond the reach of the Board of Electrical Control, or anybody else, according to the statute of limitation. But we do not take advantage of this statute."

Gen. Swayne said that as long as the company operated its telegraph system according to privileges given to it by the United States Government he could not see by what right the Board of Electrical Control, a State creation, could interfere with the system. "This petition," he said, "is to preserve the *status quo* of the corporation until a maturer presentation can be laid before the court."

Assistant Corporation Counsel Dean said in reply:

We do not dispute the rights the Western Union possess under the laws of the United States, but we say that in the conduct of their business they must submit to the police power of the State. The mail wagons running between this building and the Grand Central depot cannot go beyond a certain speed. On the same principle the State can not say that the Western Union shall not maintain its wires, but that it shall not maintain them on poles. They say they find it impracticable to use the subways, whereas on the very day they got out this restraining order they sent us a notice that they were making active preparations to put the wires underground in Sixth avenue and remove the poles there.

Col. Wilson of the American Rapid Telegraph Company argued that it was illegal on the part of the Board of Electrical Control to let out to the Subway Company the exclusive privilege of building all the conduits, and to allow it to charge exorbitant rents for the same. As the matter stands now, he said, the State Legislature, through the Board of Electrical Control, takes away rights vested in corporations by the United States.

Judge Wallace reserved his decision.

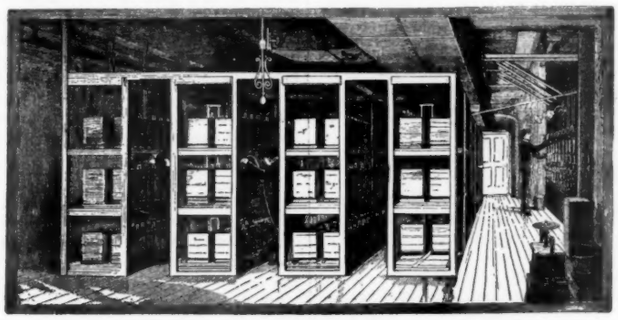


FIG. 3.—STORAGE BATTERY PLANT IN THE TELEPHONE BUILDING.

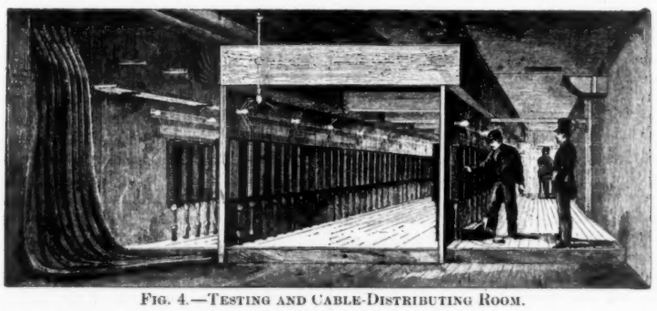


FIG. 4.—TESTING AND CABLE-DISTRIBUTING ROOM.

TELEGRAPHIC

.... Myron D. Law, the electric light man, of Philadelphia, has invented a very promising lightning arrester.

.... The Western Union Telegraph Company has made an extensive reduction of rates. The reduction affects about 10,000 offices in 20 different States, and is from 10 to 15 cents on the first 10 words and one cent on each additional word. Night rates have also been reduced in 23 States.

.... City Electrician Cummings of Portland has been in charge of the fire alarm service for 19 years, and during his administration the system has been brought to a high state of perfection. There is no doubt, however, says the Portland *Argus*, but what, with the march of improvements, some of the city's instruments are rather behind the times and should be replaced with the most modern instruments—especially in a service upon which so much depends.

.... The Societe Medicale de Bruxelles has offered a prize of 2,000 francs for the three best papers upon the following subjects: 1st. The measurement of the electric currents in the animal tissues. 2d. The measurement in ohms of the resistance offered by liquids and tissues in living organisms to feeble currents. 3d. A review up to date of the works on, and researches into, the theory of electric endosmose and its application to the phenomena of secretion in living organisms. The papers must be sent to Dr. Stienon, Rue Horn, Brussels, before January 1, 1890.

.... At the 18th annual entertainment to the Edinburgh telegraph messengers, Mr. Andrew Gray, superintendent, stated that telegraping work was increasing day by day. Last year no less than 40,000,000 telegrams passed through the hands of the Edinburgh staff, or slightly more than 500,000 of an increase compared the previous year. It was no uncommon thing to send out as many as 200 per hour for delivery to the public in Edinburgh. In one of the branch offices as many as 50 messages had been handed in in five minutes. On the announcement of the result of a Parliamentary election, hundreds were often handed in within a few minutes.

.... The telegraph operator at North Lansing, Mich., was made the victim of an "April fool" joke, as follows: About 1 A. M. a message was received at the Michigan Central R. R. telegraph office by operator Brown, addressed to C. H. Zolan, stating that an organized gang of robbers had planned to "do" Lansing Saturday night, by first robbing the depots, and then the banks and American Express office. To this was affixed the signature of "O'Brien and Dobbins," Chicago. The operator, when he could collect his senses, called the telephone office and nearly prostrated night operator Smith there by reading him this telegram; and when he recovered from the shock he called up the manager, and, after several severe efforts to get control of his tongue, finally made the manager understand that the town was to be burglarized. The manager notified the police. About 1.15 A. M., another message was received at same office recalling the message. It is supposed that the operators along the line were aware that Mr. Brown was from the country and took advantage of his ignorance and got an April fool on him. It was rumored that Mr. Brown fainted from the effects of these two telegrams, and was found unconscious by a fellow-operator. Mr. Brown now swears that if any man ever springs an April fool joke on him again on the 30th of March, nothing will satisfy him but that man's blood!

* * An electric railway is proposed from Red Bank to Seabright.

* * An electric road, estimated to cost $100,000, is talked of at Spartenburg, S. C.

* * The Macon (Ga.) Gas Light and Power Company have put in a 600 light Thomson-Houston dynamo.

* * The Pleasant Valley Passenger Railway of Pittsburgh has decided to adopt electricity as its motive power.

* * Chicago (Ill.) parties have bought controlling interest in the Houston (Tex.) Street Railroad, and will adopt electricity as a motive power.

* * The directors of the new street railroad at Portsmouth, N. H., have decided to run the cars by electricity, provided the city will grant permission.

* * The rapid adoption of electric light in Japan has caused a proposal to increase the capital of the Tokyo Electric Light Company from $250,000 to $500,000.

* * The Atlanta & Edgewood Street Car Company, of Atlanta, Ga., previously mentioned as building an electrical railroad two miles long, contemplate extending it to Decatur, Ala.

* * The track of the first five miles of the electric street railroad at Chatanooga, Tenn., has been completed. The company will build 20 miles of track altogether and it will be laid as rapidly as possible.

* * The Supreme Court of New Jersey set aside the injunction against the electric railway on Atlantic avenue, at Atlantic city, and the work of construction was resumed last week and went forward with a rush.

* * Electric lighting seems to be growing in favor in Denver, as one of the local companies there not long since placed an order for two Brush arc dynamos, each having a capacity of 65 lights of 2,000 candle power.

* * The Steubenville Gas Light and Coke Company, Ohio, has purchased the plant of the Steubenville Electric Light Company, paying therefor $45,000, which includes the bonded indebtedness of $9,000 of the concern.

* * The directors of the Jamestown (N. Y.) Street Railway Company are discussing the advisability of extending their lines and adopting electricity. Mr. P. P. Beals, of the Sprague Electric Motor Company, is giving the gentlemen some light on the question.

* * The new electric car of the Westinghouse Electric Company is now almost completed. The two Telsa motors, the regulators, the brake and all necessary machinery for putting the car in motion have been put on the truck, and all now required is the top.

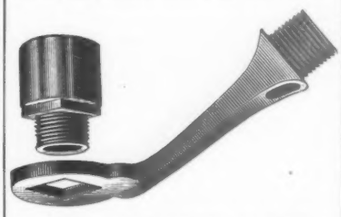
* * Two more electric street railroads are talked of for Salem, Mass. One is the Enos Electric Railway, the representatives of which desire to run cars from Peabody to Salem. The other company desires to establish a line to develop a summer resort as yet practically in the wilderness, although it is now a favorite rendezvous for picnic parties.

* * An electric street railway to connect Wrentham, Plainville, North Attleboro and Attleboro, appears to be a certainty. A proposition for its construction has been received from W. A. Boland of Boston, representing the Thomson-Houston Company. The proposition was accepted. It is stated that work will commence at once, and cars will be run by June.

A New Electric Lamp Attachment.

A new attachment for placing incandescent electric lamps on gas fixtures was patented on the 2d inst., by Mr. E. F. Gennert, which has several points of merit. Previous to its introduction, the attachments of arms in use were placed on the gas fixture nozzle or nipple, the centre or plate of a glass globe holder was put on top of the attachment, leaving but a few threads for the gas burner, which acted as a nut, or a lock to hold the globe holders and attachments in position; in turning the key of the electric lamp on and off the attachment was loosened, the gas burner partly unscrewed, causing gas to leak, and frequently burning insulation of the wires.

The attachment illustrated herewith successfully overcomes these difficulties; it consists of two parts, a base which is firmly secured to the fixture, and an arm for supporting the electric lamp; the base is supplied with a male thread for the gas burner; under this there is a square shoulder, and the eye of the arm being provided with a corresponding opening, it fits snugly on the base. It will be seen that the arm may be placed in any direction corresponding with one of the angles on the neck of the base piece. The globe holder can be placed below the base or above the arm, and when the gas burner is screwed on, the whole will be securely held against turning.



The new attachment is already improved upon by making the eye star shaped, and using a steel pin in the shoulder of the base, which pin enters into one of the points of the star-shaped eye. The E. P. Gleason Manufacturing Co., of New York, are the sole manufacturers of this new attachment, which is numbered "E 479½" in their catalogue of 1889.

A Wire Company in Trouble.

The Callender Insulating and Waterproofing Company of New York has become financially embarrassed and suspended operations. A committee of creditors has been appointed to investigate the company's affairs. The company will probably be able to reorganize if an extension of six months is secured.

* * In Hackensack, N. J., the other day, bids were opened for lighting the streets of that place, and the contract awarded to the Edison Electric Light Company. Great interest was manifested in the matter by the public, and there was lively competition, nine bids being received. The local gas company, after years of calm slumber and indifference to public complaints, awoke to the fact that competition had come at last, and made a desperate effort to retain the contract. Under the existing contract it charges the town a little over $18 a lamp, and lights them only to 1 A. M., and only on the nights when the almanac says there is no moon. If there is a young moon, with heavy clouds, the town is in darkness. The gas company offered to furnish light under the present time schedule for $12.65 per lamp, to include dark nights when there is a moon for $14.65, and to light them every night and all night for $16.65 per lamp. At the latter rate it was estimated that the total cost per year would be $3,330. The electric light bids, at 30-candle power, reduced to an annual charge, were as follows: Edison Company, $3,000; Attica Company, $6,000; Marion Company, $4,300; Easton Company, $3,500; Bergen County Electric Light Company, $5,000; and three private bids of respectively $3,750, $5,000 and $4,000. The contract with the gas company will expire August 1.

A Little Philosophy on the Electric Light.

(*From the New York Sun.*)

Mayor Chapin, of Brooklyn, philosophizes on the subject of light in the message that he has sent to the Board of Aldermen. He holds that the proper lighting of the streets at night is advantageous to public morality, tends to prevent crime, and otherwise promotes the welfare of the community. Deeds of darkness are perpetrated by those who hate the light, whether it be solar, gaseous, or electric. He says that a well-lighted city offers fewer hiding places for wrong-doers than an ill-lighted city, and needs fewer policemen. He illustrates his argument by facts from the history of Brooklyn, where regions once prone to lawlessness have undergone regeneration since they were properly lighted, and he is desirous that the facts in the case should be known in the great city of which he is mayor. We believe that Mayor Chapin's philosophy of light is sound, and that the experience of Brooklyn is in accord with that of other cities. Lawlessness and crime have decreased in London and Paris since the adoption of gaslight in illuminating their streets and squares. The change thus brought about in both of them within a century has been very great, and has often furnished a theme for philosophers.

The Cost of Electric Lighting.

Mayor Atkinson, of Winchester, Va., says that he has sent letters to 125 cities and towns where the electric lighting system has been adopted and received replies from 80. He finds that in those where the light was kept burning all night the average cost was $140 per year, where the Philadelphia moonlight schedule was practiced the expense was $109, while in those where the light was kept burning until midnight only, every night, the cost was $96 per annum.

A Kind Word from the Buckeye State.

(From the Fremont, Ohio, *Journal.*)

The ELECTRICAL REVIEW, printed at 13 Park Row, New York, is a superior weekly paper, dealing exclusively with electrical light and power, the telephone, telegraph and kindred subjects relating to scientific progress. It is firmly established, with nearly 12 years experience. Any one interested in electrical reading and intelligence will find the REVIEW just suited to this want.

A Long Name and a Big Capital.

The Secretary of State at Springfield, Ill., issued last week a license of incorporation to a company with the following extraordinary name: "United States Vogel Kazaphone and Electrical Microphone Trumpet Acoustic Electromoter Power Musical Car Distance Loud Speaking Transfer Instrument Company, Chicago," with a capital of $65,000,000, to manufacture instruments, rent rights and privileges.

Electrical Contracting.

Mr. Eugene T. Lynch, Jr., for several years the general manager of the United States Electric Illuminating Company of New York City, has been for nearly a year past engaged in making estimates on complete electric and steam plants, electric street railways, etc., with headquarters in the Equitable Building, 120 Broadway. This is a branch of the electrical business that is certainly not crowded, and one in which the experience and knowledge possessed by Mr. Lynch make him a very successful and busy worker in the electrical field. The value of expert and reliable information is particularly sought after by many of the new investors in electrical work. The South has proved a source of much demand for practical and expert knowledge of this kind, and Mr. Lynch has made a number of satisfactory estimates as well as contracts with representatives of that section.

—— The Decatur, Ala., Light and Power Company contemplate adding an electric light plant to their gas works.

Compensating Balances.

A writer in the *Watch Dial*, for December, rises to impart to its readers, under the semi-mysterious caption of "A fact not generally known," a bit of extraordinary information on the momentous subject of non-magnetic balances, in the following language:

"It is a fact not generally known to those not familiar with the properties of metals, that the so called non-magnetic compensating balances are composed of material that will not return to its original dimensions after expansion by heat or contraction by cold."

The *naivete* of this is charming, and that it is bona fide and not a blind is proven by the pictures he adds to illustrate his meaning, which we take the liberty to reproduce.

The first, he says, "represents the position of the balances at ordinary temperature, and the other two show them under the effect of extreme heat and cold."

The illustrations and explanations are exact reproductions and we need only add that the effect on the balance, of the extremes intended to be illustrated, is just the reverse. We first credited this contribution to our friend Mr. Giles, but on second thought we

concluded that even he could not be guilty of such a blunder.

Satisfied apparently, however, that he has carried his point, the writer continues as follows:

"A good steel spring will return to its original size and shape, and may therefore be accurately regulated after expansion or contraction. But this is not so with a spring composed of non-magnetic material. Such a spring will continue to gain or lose after such exposure and cannot be regulated. Any watch adjuster can see through this without any trouble."

We felt somewhat dazed, almost discouraged, we may say, when we read this, and we were sorry that the writer had made it so short. By degrees, however, it came to us.

We saw the explanation in the superscription. We cannot blame the writer for not offering any proof of the truth of his assertions; we don't think he, nor anybody else possesses any, and his statement is indeed "*a fact not generally known.*" Our curiosity as to who the writer might be led us to turn over a leaf or two when our eyes lighted upon the article "The Magnetic Bug-a-Boo" in the same number of the *Watch Dial*, and perusing it, our doubts vanished; we felt sure that it must be the adjuster of the Hampden watches. He alone, poor fellow, must have failed to "see through it," all the other adjusters, we are sure, can. It would appear from that article that the Hampden Watch Company has not yet succeeded in the discovery of a patentable alloy for non-magnetic balances, hence the position behind which it seeks to entrench itself, that the latter are no good. When it does, we shall hear of it. Allow us to speak a word of encouragement: "Never say fail," and remember that while the Hampden watches are very good for some purposes, when a man whose business is to sit on a dynamo, wants a watch that will keep time in that environment, they will not answer the purpose; nothing short of a non-magnetic watch will fill the bill.—THEO. GRIBI, *formerly Foreman Adjusting Department Elgin Watch Co., Chicago, Ill.*

A New Testing Set.

The new testing set, invented by F. B. Badt, and owned by the Western Electric Company, which we illustrate on this page, is a valuable addition to working the outfit of the dynamo man, lineman, etc. It is made of a highly polished cherry, the box containing a small dry galvanic cell, detector galvanometer of 500 ohms resistance, contact key and two binding posts. The external dimensions of the box are 5¾x3¾x2⅞, and the total weight one pound and 15 ounces. The galvanometer, key and binding posts are mounted on a sliding shelf, beneath which is the dry cell. By opening the end of the box, the shelf can be drawn out for inspection or repairs. The standard resistance of the coil is 500 ohms, but they are made of any resistance to order. One cell will deflect the needle a few degrees, even through a resistance of 15,000 ohms.

—— The address of Mayor Chapin, of Brooklyn, on the electric light question, is published in abstract on another page.

—— The Manhattan Electric Light Company of New York have in operation underground 920 feet of cable on Twenty-fourth street, 220 feet on Fourth avenue, and in the ducts on Broadway, ready for use, 25,420 feet.

—— At New Britain, Conn., April 2, 1889, at the Thomson-Houston stockholders meeting, nearly all the stock was represented. It was unanimously voted to increase the capital stock to $4,000,000; $1,000,000 in stock dividend and $1,000,000 for stockholders at par, to be paid for in cash, and $1,000,000 preferred at 7 per cent., to be disposed of as the directors see fit.

—— The following bids for putting in electric light at the county buildings were recently opened at Rochester, N. Y.: Brush Electric Light Company, $6,450; United States Electric Light Company, $6,700; Thomson-Houston Electric Light Company, $4,845; Edison Electric Light Company, $5,800; Atkinson & Sykes, $5,175; Western Electric Light Company, $5,800. The contract was awarded the Thomson-Houston Company.

—— It appears that the addition of the electric light to the arrangements of the House of Commons has increased rather than decreased the expenses for gas. Last year the gas bill was £3,300, whilst the cost of the supply for the coming year is estimated at £4,000. This is in addition to an increase in the expenditure on electricity of £10. The supply of oil lamps in the Houses of Parliament still maintains its immense proportions. This year as last not less than £2,000 is paid for oil for the lamps.

—— The Baton Rouge (La.) Electric Light and Power Company has consolidated with the Baton Rouge Gas Company. The capital stock of the company under the new management has been increased from $15,000 to $60,000, all of which is taken and held by home capitalists. Part of the machinery for the electric light plant has already arrived, poles and wires are being erected, and everything will be in operation by the first of May. The name of the new company will be Baton Rouge Gas, Electric Light and Power Company.

—— In the Baltimore council a Mr. Beck has offered an ordinance, which was referred to the committee on police and jail, authorizing the mayor, comptroller and register of the city to contract for lighting the streets, alleys, parks, public buildings and other places where electric arc lights are used by the city. They are authorized to contract for five years with the lowest responsible bidder, to advertise three times a week for two weeks in three daily papers, and the contract to be awarded at noon June 1, and the lighting begin December 1, 1889. Each proposal shall be accompanied by a deposit or certified check for $5,000, to become the property of the city in case the successful bidder fails to enter into the contract or to file bond for $20,000.

Removal of Electric Light Headquarters.

The headquarters of the National Electric Light Association have been moved down town. They have been for the past eight months at No. 16 East 23d street, a very convenient up town location. On Monday of this week they were removed to room 512 in the new "Telephone" building, 18 Cortlandt street, one of the most convenient locations that could have been secured.

Members of the Association in correspondence with Secretary Garratt should make a note of this address.

—— Hartford electric light men complain that birds attempt to build nests in the lamps and on the frames of the lamps, and so cause much annoyance. One or two unused lamps are occupied by nests on which sparrows are setting.

—— The board of directors of the Electric Light Company at Walsenburg, Colo., has selected the Edison system of light and let the contract to F. P. McMullen, of Denver. He takes nearly one-third of the stock, an evidence that Denver capital has confidence in Walsenburg and the electric light.

—— The San Jose, Cal., Brush Electric Light Co. held their annual meeting recently and elected directors. The following officers were elected to serve for the ensuing year: Adam Riehl, president; Uriah Wood, vice-president; Thomas Rea, treasurer; W. W. Gillespie, secretary and superintendent.

—— The Navy Department will erect an electric light plant at the yard at Portsmouth, Va.

—— W. P. Chandler, Farmersville, La., wants information regarding electric light machinery suitable for lighting towns.

—— The mayor of Portland, Oregon, has vetoed the ordinance contracting for city lighting with the Willamette Falls Electric Company. He wants competition, and asks for bids from other companies.

—— The Salem Electric Lighting Co. held a meeting Monday evening and voted to increase its capital stock from $70,000 to $140,000. This for the purpose of completing the Peabody street improvements.

Electrical Testing Set Manufactured by the Western Electric Co.

—— If the writers who are giving the public the tables of comparative cost per night of "electric lighting" in different cities would at the same time tell whether the lamps are lighted *every* night and *all* night, they would add valuable particulars, data, in fact, so indispensable that the tables of figures are shorn of the greater part of their value without them.

—— The streets of Anniston, Ala., are again bright with electricity. The old contract having expired on the first of January last, an interval of darkness intervened till the 26th of March, when a contract with the Thomson-Houston Electric Light Company of Boston was signed. This company has purchased of the Anniston City Land Company their old plant, wires, poles etc., and intend to invest $40,000 more in their works.

—— Waterhouse arc lighting installations as follows are reported by the Westinghouse Electric Co.: Central Stations—South Omaha (Neb.) E. L. Heat and Power Co., increase of 35 lights (35 previously installed); Berlin Falls, N. H., Forest Fibre Co. 35 lights; Brookings (Dakota) Electric Light Co. 20 Lights. Isolated Plants—Philadelphia, Pa., Pennsylvania R. R. Co. 70 lights; Cincinnati, O., Weir Frog Co. 35 lights.

—— The Consolidated Electric Light Company, of New York, declared a quarterly dividend of one per cent., on the 19th inst., out of the net earnings of the current quarter. The stock of the company is now listed on the active list of the New York Stock Exchange.

—— A new steam plant is to be erected by the Merchants' Electric Light and Power Company of Concord, N. C., consisting of two 150 horse power engines, and two 125 horse power boilers. The new plant will be in running order about May.

—— The Williamstown, Mass., Electric Light Company has applied for permission to put in a gas plant, but will put in electric light first. It intends to use water-power, and will consume 120 horse-power. No decision has yet been reached as to what system to use, but the company means to go ahead as soon as possible.

—— The Brooklyn Electric Light and Power Company will hold their annual election for officers and directors this week. The present directors are George Ricard Connor, John T. Runcie, Richard G. Phelps, Noah L. Cocheu, Franklin Coit, Charles W. Smyth, Thomas W. Black and Lewis R. Stegman. The present stock of the company is $250,000.

ELECTRIC LIGHT NEWS

—— Elmira, N. Y., is calling for more electric light.

—— The Decatur, Ala., gas works will add an electric light plant.

—— The Houston, Tex., Street Railroad will adopt electricity as a motive power.

—— Efforts are being made to build an incandescent electric light plant at Orange, Texas.

—— Philadelphia is agitating the electric light question and a committee is investigating prices.

—— Winchenden, Mass., has appropriated $1,200 for street lighting. The local papers want electricity.

—— The committee on public improvement of the Commercial Club in Danville, Va., are considering electric lighting.

—— The Meridian Electric Light and Power Company will put in a 1,000 light incandescent plant this fall, at Meridian, Miss.

—— Newton, N. C., will vote on May 6th on the proposition to issue $10,000 of bonds for electric lighting and street improvements.

—— The three lamp factories of the Westinghouse Company—New York, Pittsburgh and Newark—have a capacity of 18,000 incandescent lamps a day.

—— The Municipal Assembly at St. Louis has approved the recent contract for lighting the city entered into by the Electrical Accumulator Company of that city.

—— At Fostoria, O., April 3, Harry L. Hogue, superintendent of the electric light plant, was killed by coming in contact with the current while repairing a dynamo.

—— A few days ago the Brush Electric Company, of Cleveland, Ohio, received a cablegram ordering two No. 7 arc dynamos, dials, etc., to be shipped to South America.

—— The Penn Fuel Gas and Electrical Engineering Company has in contemplation the building of a foundry and machine shop at Wilmerding, on the Pennsylvania Railroad.

—— The arc lights in the chamber of the Board of Aldermen at New Haven, Ct., is said to affect the aldermen's eyes, and they are talking of changing to the incandescent light.

—— The commissioners for the town of Concord, N. C., have contracted with the Edison Electric Company to have the town lighted at $1,000 a year, for 75 lights of 50 candle-power each.

—— An accident to a new high speed compound condensing engine at the Duxbury (Mass) Electric Light and Power Company, has compelled the company to shut down for several days.

—— At Griffin, Ga., the Brush Electric Light Company has asked and received the privilege of putting up their wires. This will give Griffin two systems of arc light for trial without one cent invested.

—— Alexander Kempt, the Chicago representative of the Brush Electric Company, closed the month of March by sending to the home office, at Cleveland, an order for a 65 light Brush arc dynamo, with full complement of lamps, dial, etc.

—— The Thomson-Houston Company is arranging to put in an electric light plant in Albany, N. Y. The field in that city has been exclusively occupied in the past by the Albany Electric Illuminating Company, operating the Brush system. Hon. Ed. A. Maher, the president of the company, is the present handsome and able mayor of Albany.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THIS WEEK ENDING APRIL 2, 1889.

400,300 Electric conduit; Henry A. Chase, Boston, Mass.
400,304 Hotel call; Edward J. Colby, Chicago, Ills.
400,308 Method of constructing underground conduits; William C. Cranmer and Sydney W. Arnold, Philadelphia, Pa.
400,311 Electric motor. 400,312 Thermostat; Etna H. Davis and Reuben Westervelt, Elmira, N.Y.
400,315 Regulator for electric motors; Robert S. Dobbie, New York, N. Y., assignor to the American Electric Motor Company, of New Jersey.
400,325 460,326 Telephone. 400,327 Magneto-electric generator. Noel B. Ginochio, New York, N. Y., assignor of one-half to Elias M. Greene, same place.
400,352 Arc lamp; William H. Miller, New York, N. Y.
400,366 Process of hardening steel; Frederick Sedgwick, Oak Park, Ill.
400,375 Pneumatic flexible slot conduit for electric railway conductors; Charles J. Van Depoele, Lynn, Mass.
400,378 Incandescent electric lamp; Edward Weston, Newark, N. J., assignor to the United States Electric Lighting Company, New York, N. Y.
400,395 Electric distribution by storage batteries; Stanley C. C. Currie, Philadelphia, Pa., assignor to the United Electric Improvement Company, Gloucester, N. J.
400,404 Secondary battery; Rudolph M. Hunter, Philadelphia, Pa.

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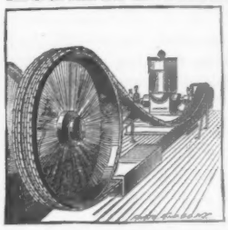

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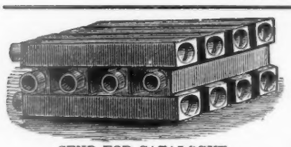

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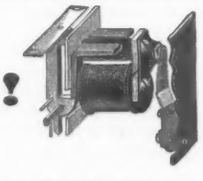

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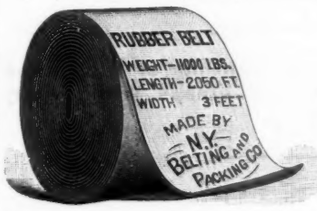

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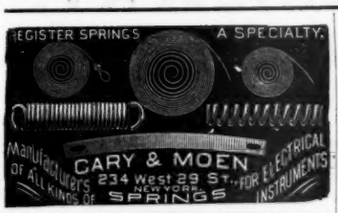
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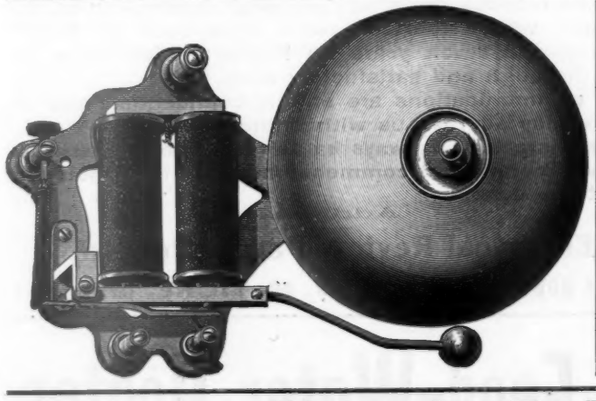

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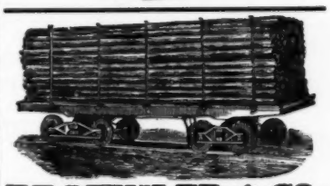

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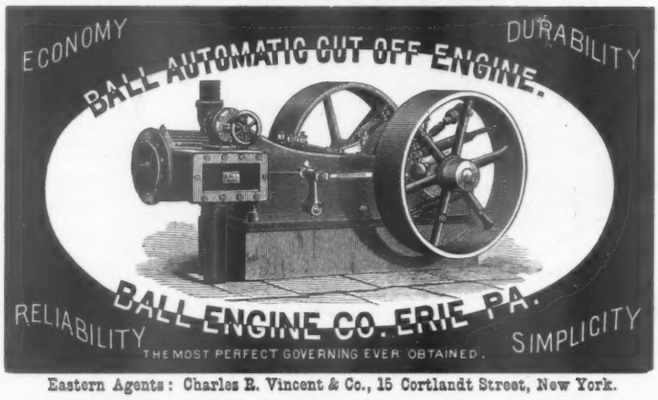

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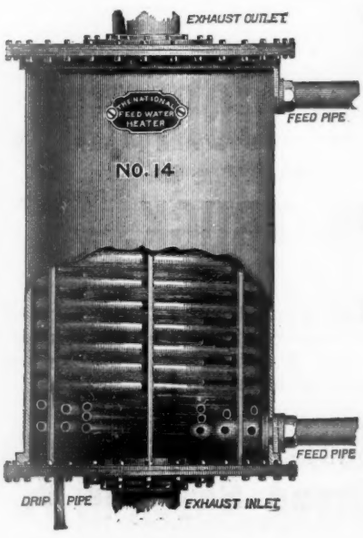

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GENTLEMEN:—I have made an extensive series of tests of your **WHITE CORE INDIA RUBBER INSULATION,** under various conditions of temperature and times of immersion in water, with the following results:

INSULATION RESISTANCE IN MEGOHMS PER MILE.

Time, - -	5 min.	1 hour	24 hours	10 days	24 days
Temperature,	60° F.	60° F.	60° F.	60° F.	60° F.
Resistance, -	3,200	3,300	3,300	3,300	3,300

Time, - -	30 min.	30 min.	30 min.	30 min.
Temperature,	41° F.	115° F.	167° F.	200° F.
Resistance, -	3,900	162	12	5 2

The times given in the upper table are those between the immersion of the wire in water and the making of the test.

The times of the second table indicate the time between that at which the tank reached the indicated temperature and that at which the test was made.

The cable had been immersed in water for a month before the first temperature test was made.

It will be observed that the temperature being at 60° F. the resistance remained constant at its highest point for 24 days, and then ran greatly on lowering the temperature.

The lowering of resistance by a rise in the temperature is a common characteristic of all such insulations and indicates no defect. Most insulations are much more affected by this cause than was this one.

This wire also showed no deterioration from exposure to moist air, fresh plaster, damp earth, etc., after several month's exposure. Its insulating power also was unaffected by a like exposure to illuminating gas. Very truly yours,

(Signed) **HENRY MORTON.**

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REPORT of a series of tests of the insulation resistance, capacity and conductivity of a sample covered wire sent by

The India Rubber & Gutta Percha Insulating Co.

The sample submitted for measurement was 2027 ft. in length.
Thickness of insulation was .281 c. m.
Diameter of wire .1632 c. m.

The wire was extremely flexible and was coiled and uncoiled several times before measurements were made.

The insulation consisted of several layers of India rubber, with an external cotton braiding.

The coil was immersed in water on Dec. 16 at 8.30 P. M., and tests were begun the following morning. Both the Direct and Loss of Charge methods were employed. The following are the results:

Capacity in Microfarads per Knot.	Insulation Resistance in Megohms per Knot.	Temperature Centigrade, Degrees.	DATE.
.453	11240	8.5	Dec. 17
.441	9558	13.3	Dec. 18
.456	10080	13.0	Dec. 19
.441	10183	11.0	Dec. 20
.450	9620	10.8	Dec. 21
.450	10000	12.0	Dec. 27

Direct deflection 7200 meghoms per knot at 12° C. on Dec. 27th. Conductivity was obtained by making a number of measurements of the diameter of the wire, and a determination of the resistance of the entire length of the sample at a definite temperature.

The conductivity was 98.5 per cent. that of pure copper as given by Matthiessen.

For the eleven days that the wire was in water the insulation resistance remained practically unchanged, and the slight variation which occurred can be accounted for by the difference in temperature, etc.

The insulation seems to be less affected by changes in temperature than that of other samples which we have tested at various times. Very respectfully,

[Signed] **LOUIS DUNCAN,**
C. A. LIEBIG, Jr.

JANUARY 5th, 1889,
WM. M. HABIRSHAW.

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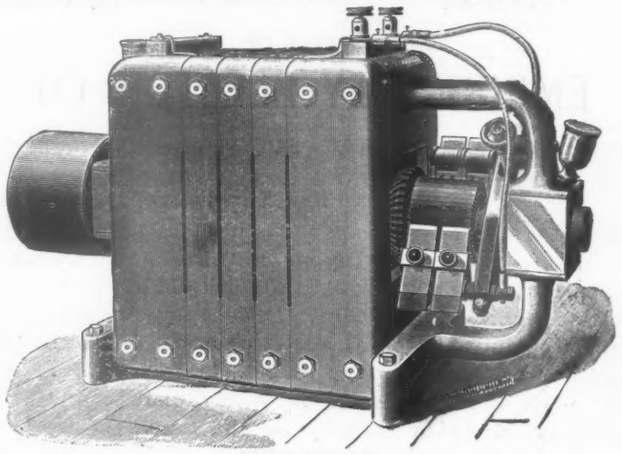

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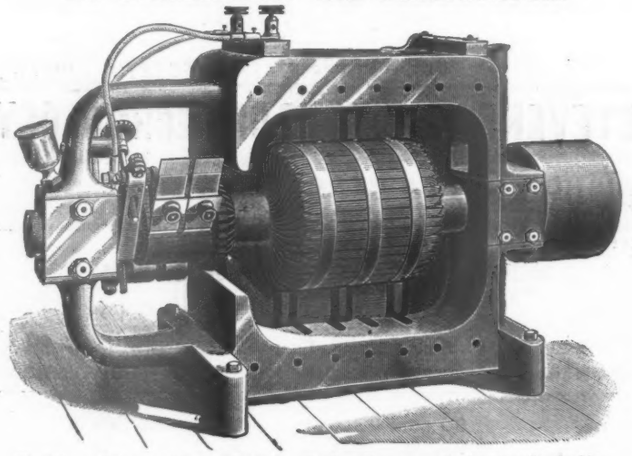

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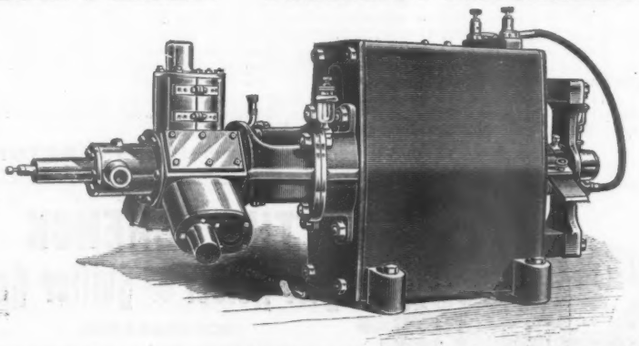

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SUSTAINING THE EDISON PATENTS.

In the many suits brought by the Edison Company, in the lower courts, against infringers of the Edison Patents, the defendants have evaded the MERITS of the controversy, thus tacitly admitting the fact of infringement, and have interposed a plea alleging that our Patents have been voided by the expiration of Patents previously granted in foreign countries.

Hence the delay in establishing our rights. In the meantime other electrical companies have been indiscriminately copying our devices and methods, not even assuming that they themselves were the original inventors, but simply relying upon the construction of a statute by the lower courts invalidating our fundamental Patent. In pursuance of our expressed determination to secure a decision upon the point of law involved, we have had the Bate Refrigerator case (covering the identical question) argued before the United States Supreme Court, with the result announced above, thus

Completely depriving the Defendants of their Main Defense.

We have now only to prove the fact of infringement in order to secure prompt injunctions against and damages from those who have been so long using with impunity that which the HIGHEST AUTHORITY now concedes to have been ours, exclusively, from the beginning. This is simply to establish

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This question has been decided in his favor a great many times, primarily by the United States Patent Office, which granted to him Patents bearing earliest dates; then by the various courts of Europe, through the crucial examination of which the question has MANY TIMES passed.

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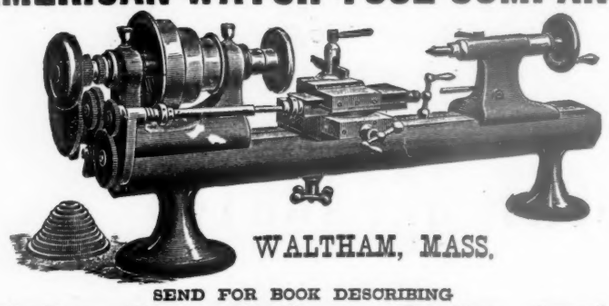

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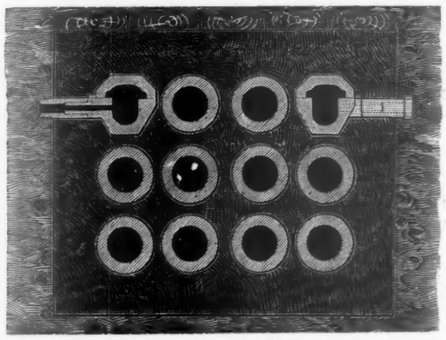

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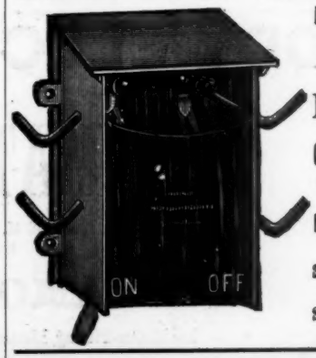

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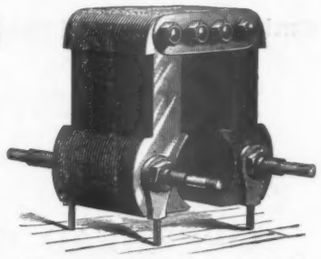

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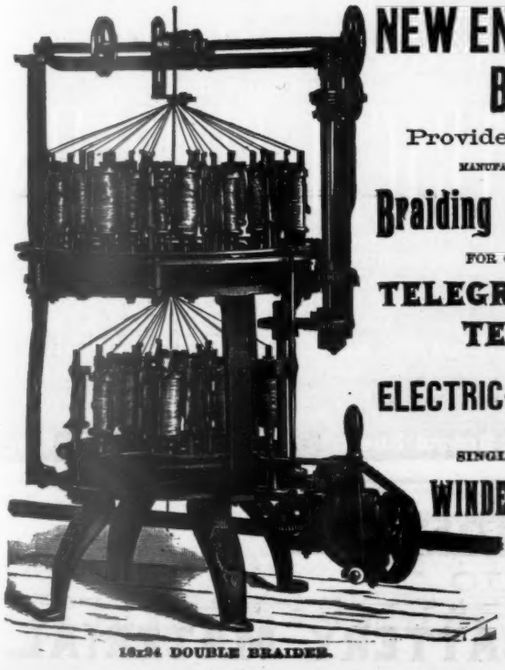

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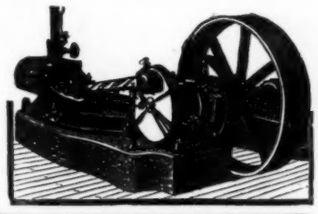

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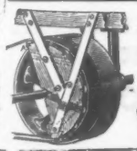

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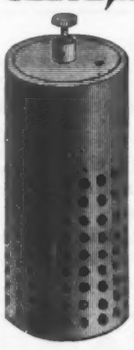

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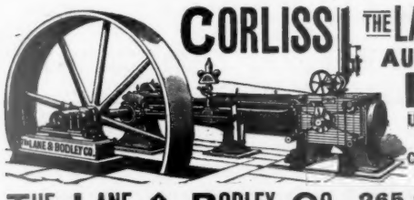

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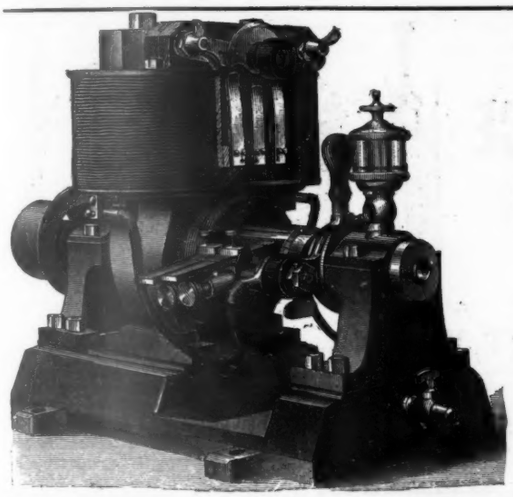

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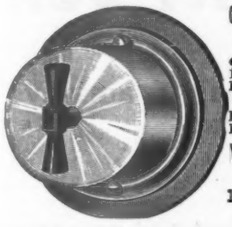

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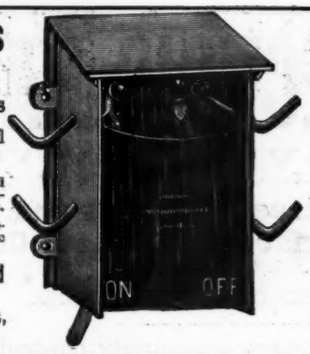

WEDNESDAY, APRIL 17TH, 1889.

ELECTRIC TRAMWAYS.
IMPORTANT ANNOUNCEMENT.

THE ELIESON ELECTRIC COMPANY, LIMITED,
Plashet Hall Works, Romford Road, Stratford, London, Eng.

SALE of the British, Foreign, and Colonial Patent Rights, Model Generating and Tramcar Station, Engines, Boilers, Dynamos, Storage Batteries, Motors, Cars, Leasehold Premises, &c., &c.

WHEATLEY KIRK, PRICE & GOULTY

ARE INSTRUCTED TO SELL BY PUBLIC AUCTION,

On Wednesday, April 17th, at Twelve for One o'Clock prompt, upon the above Premises, the valuable and well-known Patents, Properties and Effects, comprising the "Elieson" System of Electrical Traction by Motors and Secondary Batteries.

By a series of costly experiments, extending over four years, the above-named Company has successfully demonstrated the practicability of electrical traction as applied to ordinary tramways. It is the only system of electrical traction, by secondary or storage batteries, that has worked continuously in public service in the United Kingdom for a lengthened period uninterruptedly, and during such period the motors of the Company have run nearly 50,000 miles. The time has now arrived when large extensions are absolutely necessary for the introduction of the system into general use, and the means at the disposal of the Company being insufficient for this purpose, it has been decided to submit the entire property to public competition, with a view that capitalists, companies and others interested may purchase and vigorously develop the same in this country and abroad, and to facilitate this, the British, Foreign and Colonial Patents will be offered separately.

Lot 1. will comprise the British Patent Rights, together with the Leasehold Premises, Engines, Boiler, Shafting, Motor-Cars, Dynamos, &c., forming the complete generating plant and installation, as fully described in detailed catalogues, including concessions and running powers. The purchaser of Lot 1 will have the option of purchasing the loose utensils, stores, &c., at a price to be named at the time of sale.

Lot 2. and succeeding lots will will consist of the American, Colonial and Foreign Patent Rights, each of which will be offered for sale separately. Included with the American Patents will be the Motor-Car No. 3, with its equipments, now lying at New York, and which may be viewed by permission of the Belt Railroad Company at their depot in 53d street and 10th avenue; this has been exhibited at Buffalo and elsewhere.

Further particulars and descriptive catalogues may be obtained from MESSRS. VINCENT and VINCENT, Solicitors, 20, Budge-row, E. C., from T. P. GOWER, Esq., 4, Broad-street-buildings, Liverpool-street, London, E. C. (the Secretary of the Company), and from WHEATLEY KIRK, PRICE and GOULTY, 53, Queen Victoria-street, London, E. C. (Telegrams, "Indices," London; Telephone, 1533), and Albert-square, Manchester, England.

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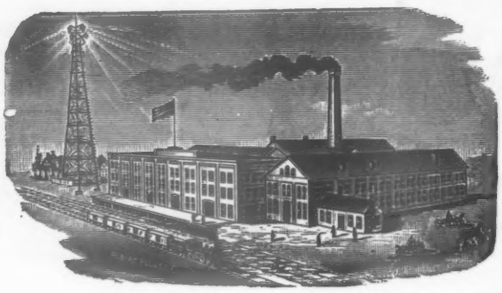

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